17-Mile Lower Passaic River Study Area
CSTAG Presentation

February 28, 2018

U.S. Environmental Protection Agency - Region 2
Emergency and Remedial Response Division
Passaic, Hackensack and Newark Bay Branch

623516

Presentation Outline

Topic	Presenter
Introduction	Michael Sivak, USEPA
Site Overview and Background	Jennifer LaPoma, USEPA
Conceptual Site Model	Ed Garland, HDR
HH and Eco Risk	Dr. Marian Olsen and Chuck Nace, USEPA
Contaminant Trends	Dr. Keegan Roberts, CDM Smith
Contaminant Mapping	Dr. John Kern, KSS
FS Considerations – Overview of CPG's Proposed Interim Action, RAOs, Remedial Alternatives	Aaron Frantz, CDM Smith
Closing Remarks	Michael Sivak, USEPA

A couple of quick notes…

- While the content of the 11 Principles is contained in this presentation, they have been combined and reordered to better present the evolution of site information.

- Material presented in this slideshow contains information developed and submitted by the CPG. This information is still under review by EPA and does not reflect EPA's endorsement or approval.

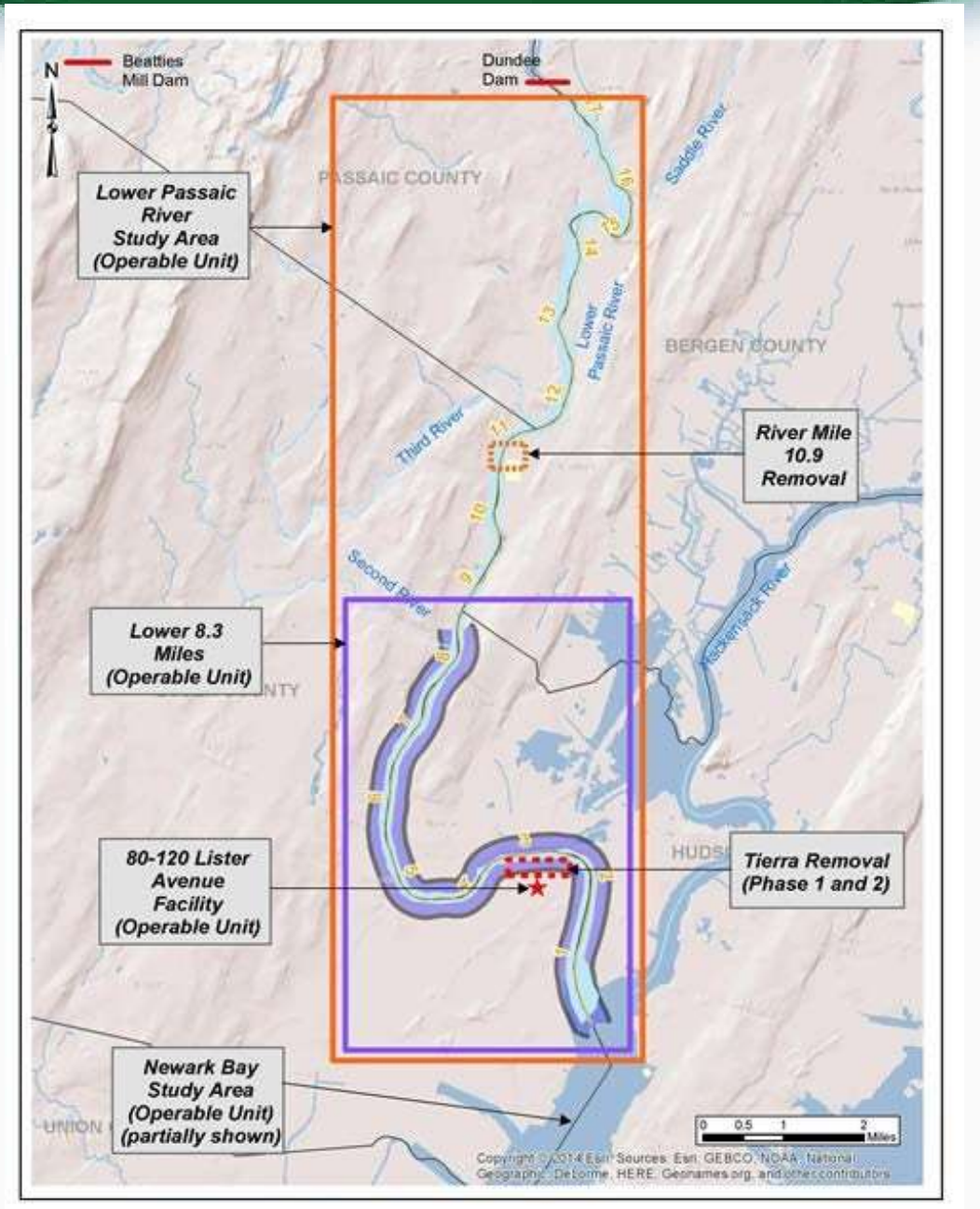
Region 2 is requesting CSTAG's feedback on the following items:

1. Appropriateness of a source control interim action for the upper 9 miles of the Lower Passaic River Study Area (LPRSA) at this time

2. Consideration of the Cooperating Parties Group (CPG) proposed interim action

3. Development of remedial alternatives

Site Overview and Background



Diamond Alkali Superfund Site Overview:

- 80-120 Lister Avenue
- Lower 8.3 miles of the Lower Passaic River
- Newark Bay Study Area
- 17-Mile Lower Passaic River Study Area

Lower Passaic River History

- 1800s: Major center of Industrial Revolution
- Until 1970s, discharge of wastewaters into river was common practice
- Over 100 industrial facilities potentially responsible for sending contaminants into river
- Navigation channel built in late 1800, maintained until 1950s to 1983
- Industrial discharges & filling in of channel resulted in large inventory of contaminated sediment

Diamond Alkali Superfund Site History

1984: EPA lists Diamond Alkali Superfund Site as a NPL site

1987: Interim ROD for containment remedy including the following at 80-120 Lister Avenue facility:

- capping,
- subsurface slurry walls, and
- a groundwater collection and treatment system

Mid-1980s: Occidental under agreement with the State of NJ determined that dioxin was in the river adjacent to their facility

1994: Occidental and EPA signed an agreement to investigate the River

By 2002, EPA expanded investigation to 17-mile tidal portion of the river

Timeline for Site Investigations

2004 to 2007: EPA RI/FS sampling of 17-miles

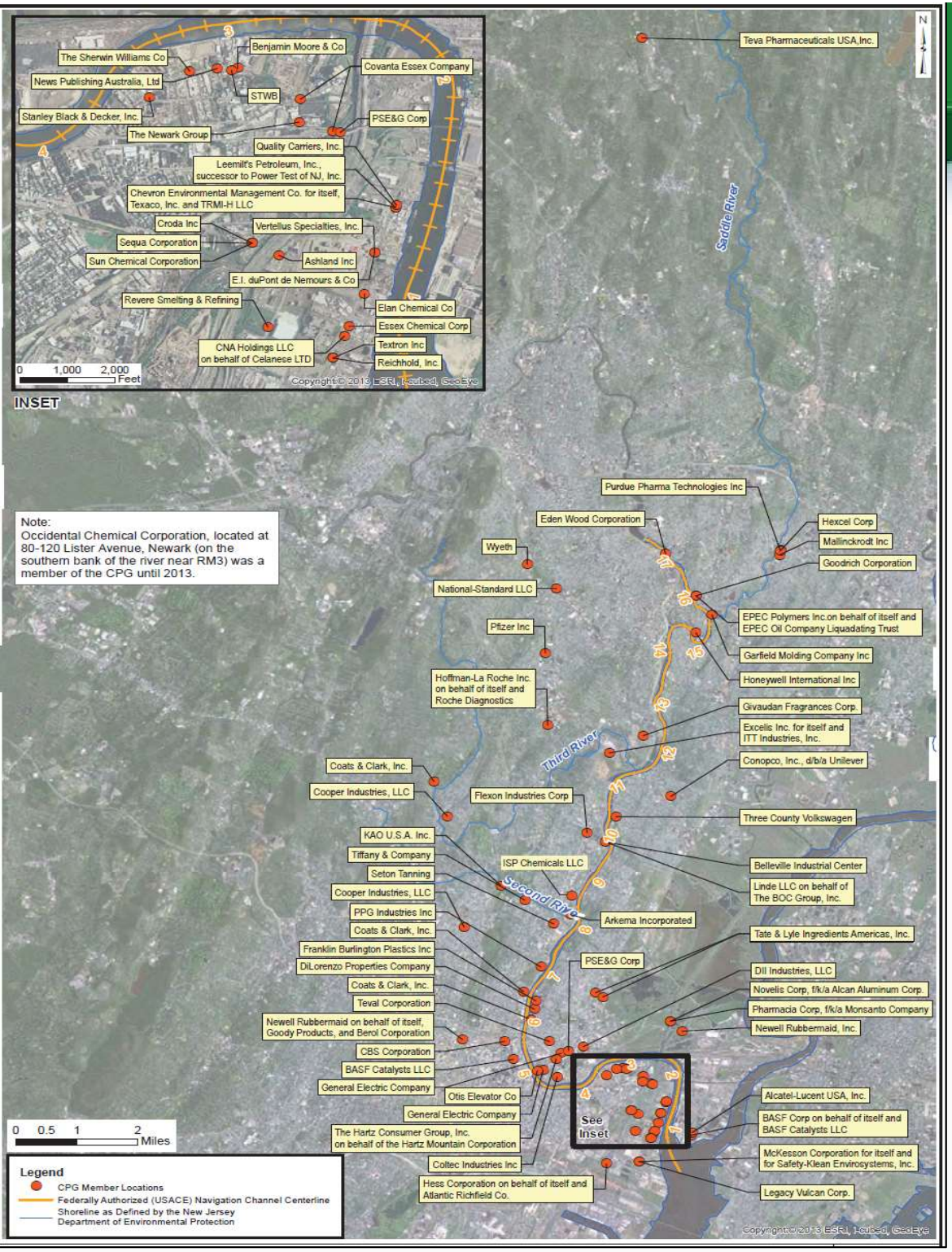
2007: CPG agrees to take over on-going 17-Mile RI/FS

2008 to 2014: CPG conducts RI sampling

2014 to now: data evaluations, analysis, report prep

RI Field Investigations Included:

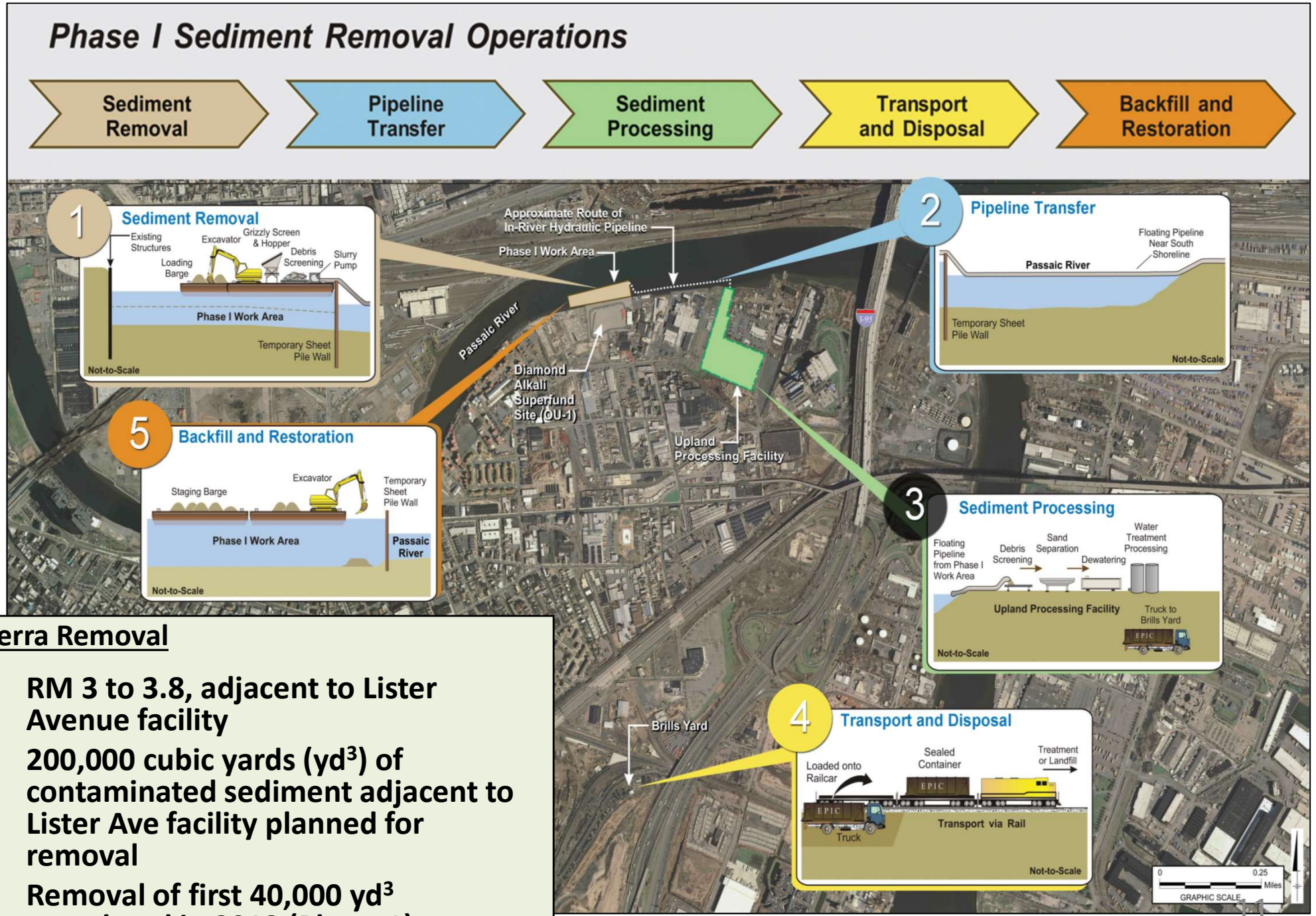
- Bathymetry Surveys
- Water Column Sampling
- Sediment Sampling
- Biological Sampling



Historic Contaminant Sources & Distribution

- Over 100 PRPs identified throughout LPRSA
- 80-120 Lister Avenue facility
- Additional contaminant sources included:
  - untreated industrial and municipal wastewater
  - CSOs/SWOs
  - direct runoff
  - atmospheric deposition, etc.
  - tributaries, Upper Passaic River, Newark Bay

Interim/Early Action Activities

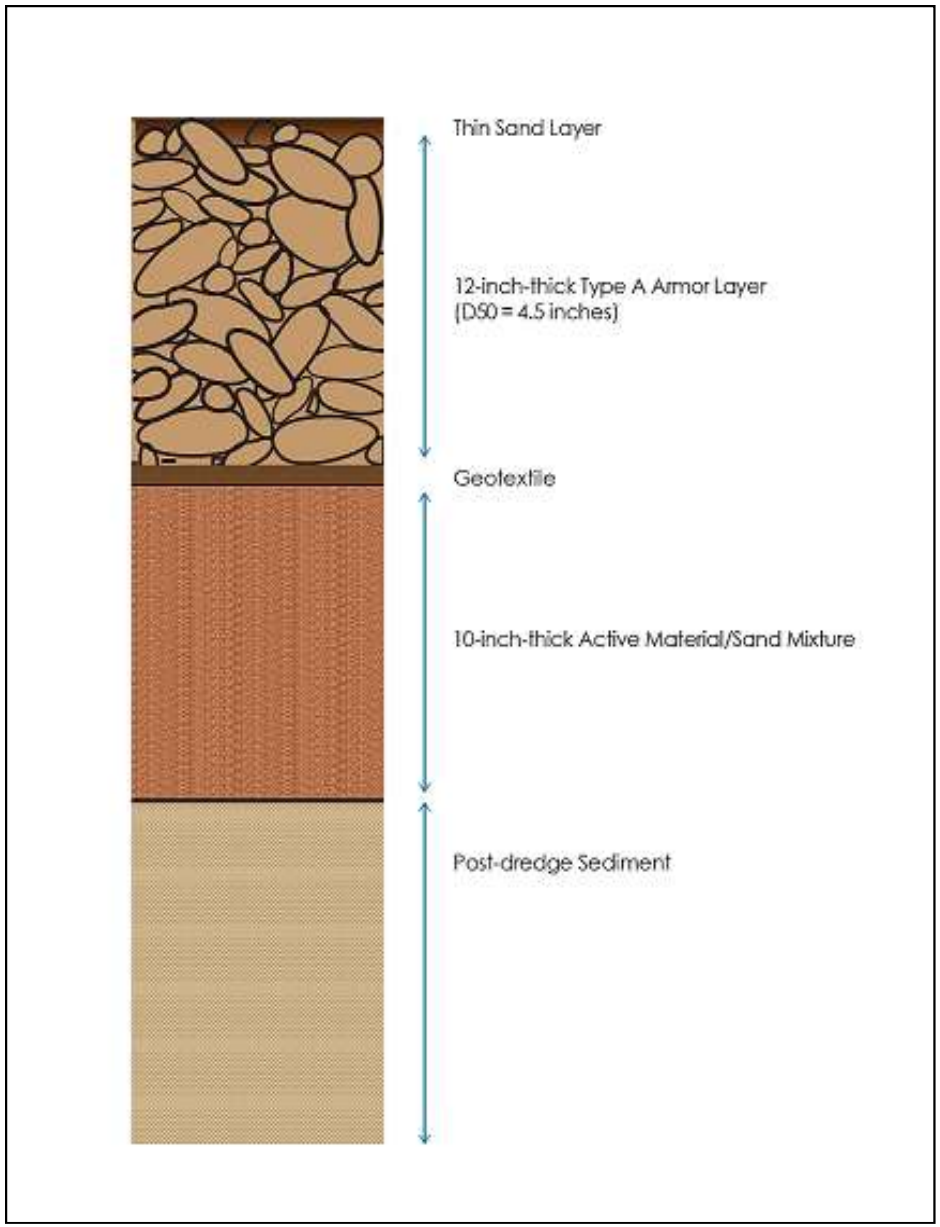


Tierra Removal

- RM 3 to 3.8, adjacent to Lister Avenue facility
- 200,000 cubic yards (yd^3) of contaminated sediment adjacent to Lister Ave facility planned for removal
- Removal of first 40,000 yd^3 completed in 2012 (Phase 1)

Interim/Early Action Activities

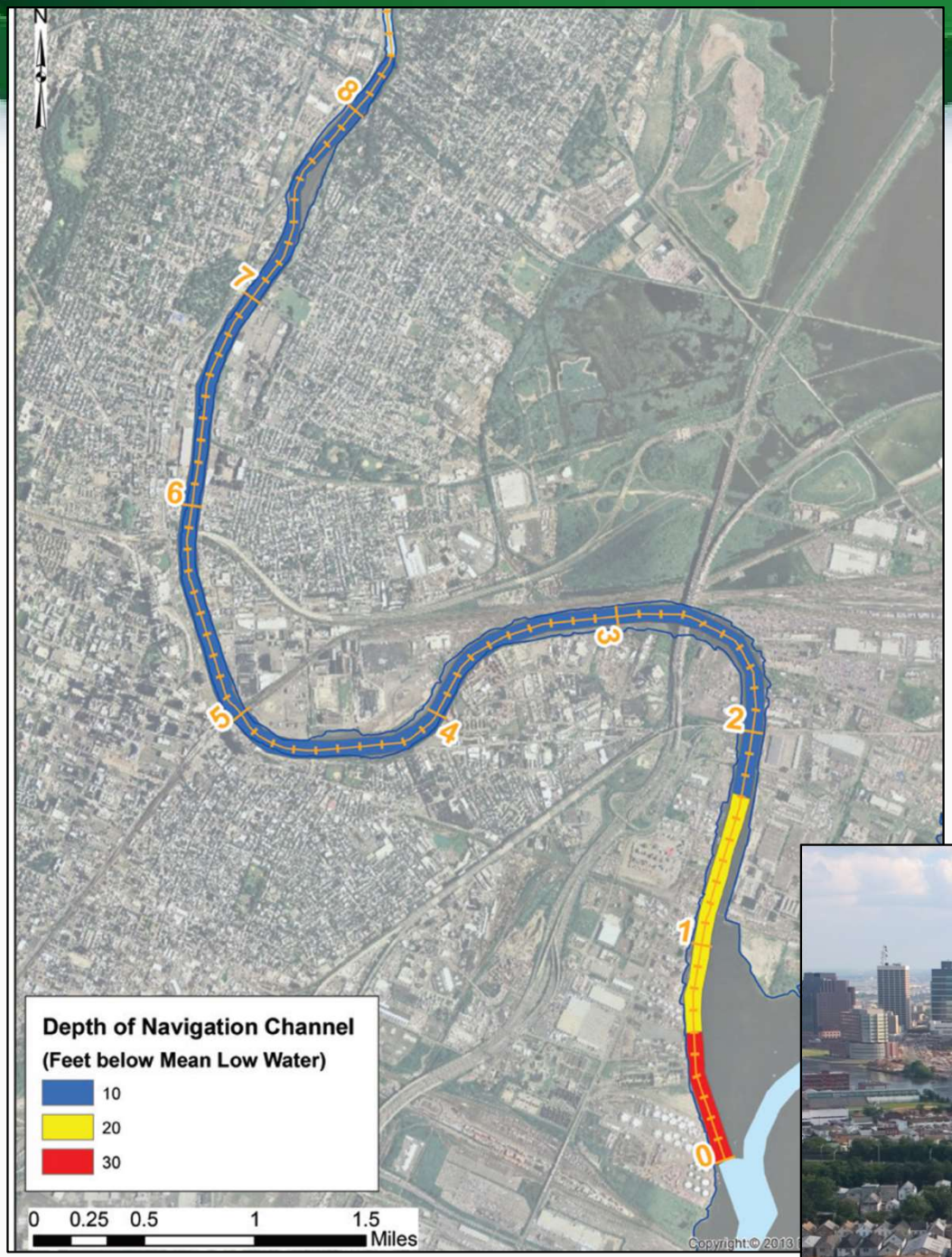
River Mile 10.9 Removal

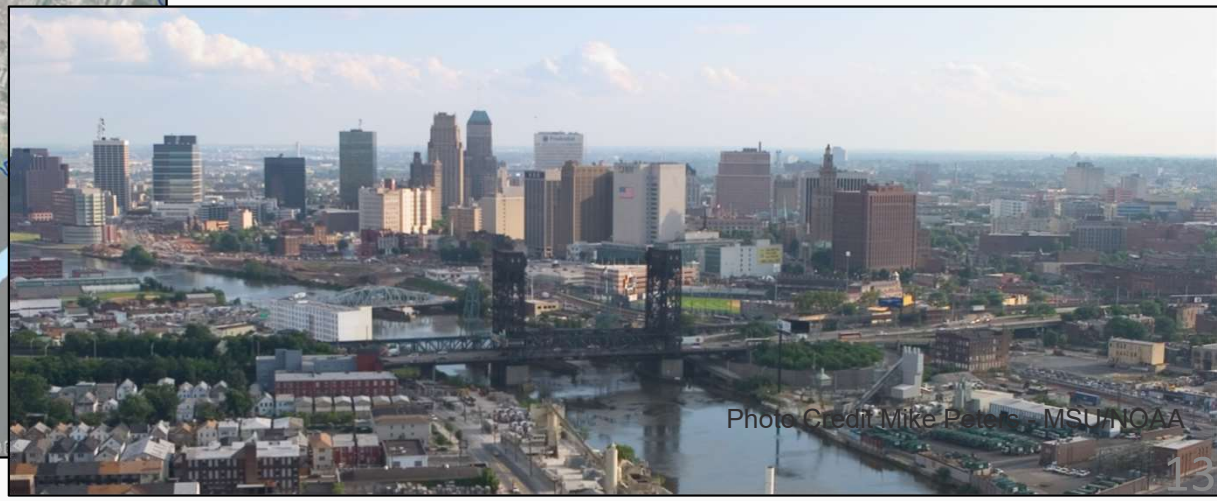


Interim/Early Action Activities

Lower 8.3-Miles

- ROD issued in March 2016, remedy includes:
- Engineered cap to be placed over entire lower 8.3 miles, bank to bank
- 3.5 million yd^3 of sediments to be dredged to make room for cap





Community Involvement Coordination

Passaic River Community Advisory Group (CAG) is made up of:

- Local Residents
- Environmental Groups
- Local Government Representatives

CAG currently meets bi-monthly:

EPA briefs the CAG on all major activities such as:

- Planned site sampling events
- River mile 10.9 removal action
- Lower 8.3 mile remedy
- Upper 9 mile proposed interim remedy

EPA maintains public web site ourpassaic.org to:

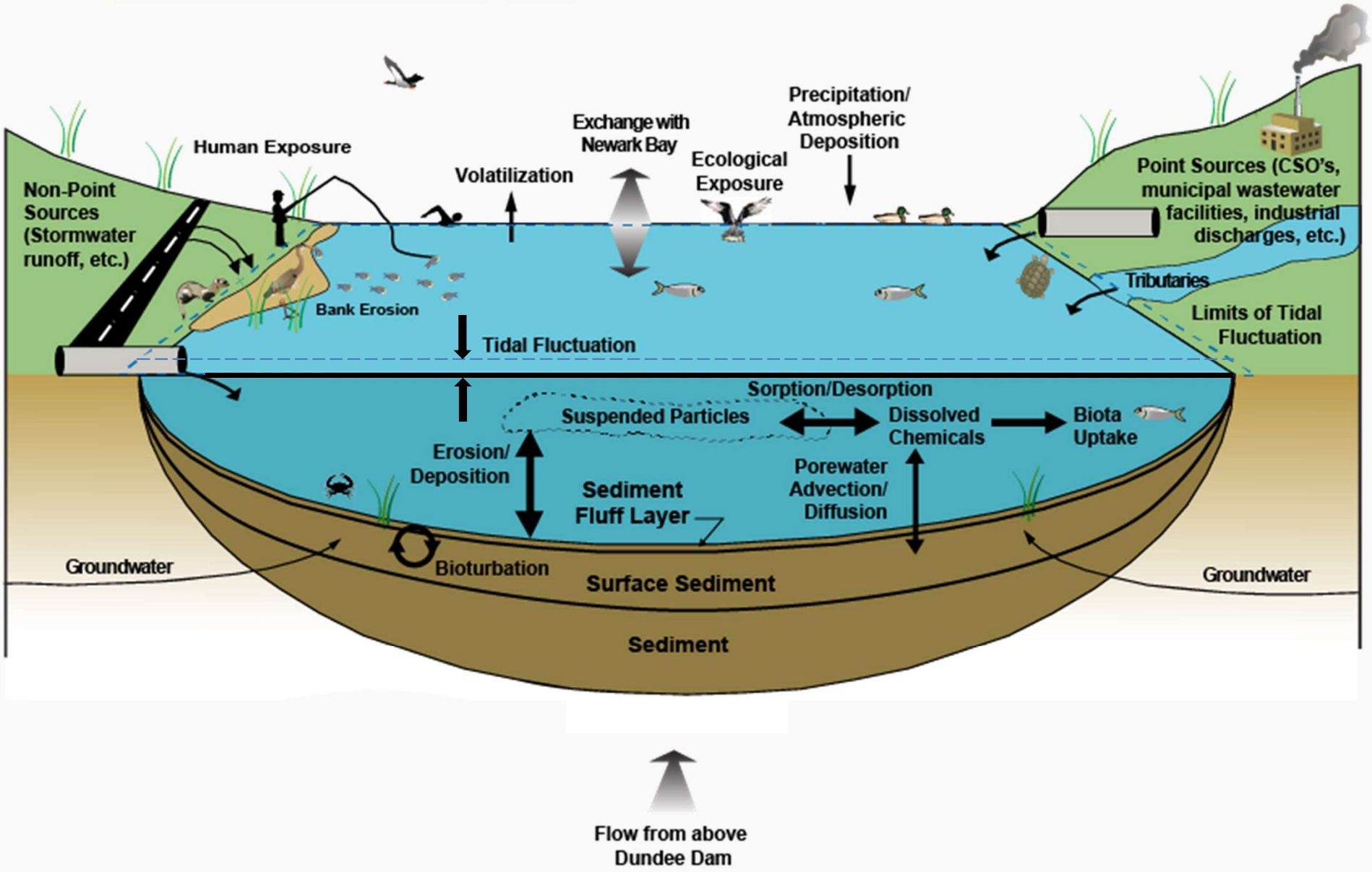
- Post fish and crab consumption advisories
- Inform public of ongoing activities
- Provide CAG meeting schedule
- Provide access to site documents and data

Coordination with Partner Agencies

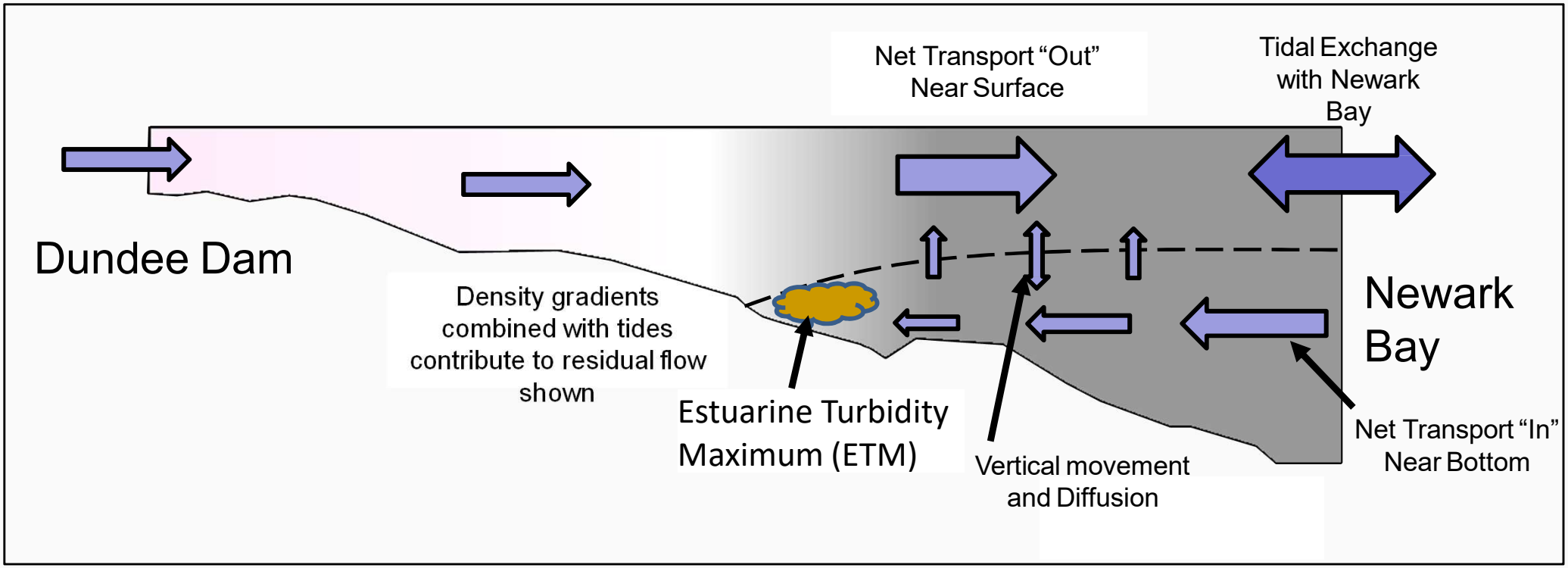
- EPA provides updates on CPG investigations and reporting
- PAs are invited to provide comments on CPG deliverables for EPA consideration
- EPA meets with PAs to discuss key topics such as:
  - COPC mapping
  - River mile 10.9 removal
  - Human health and ecological risk assessments
  - CPG's proposed interim remedy

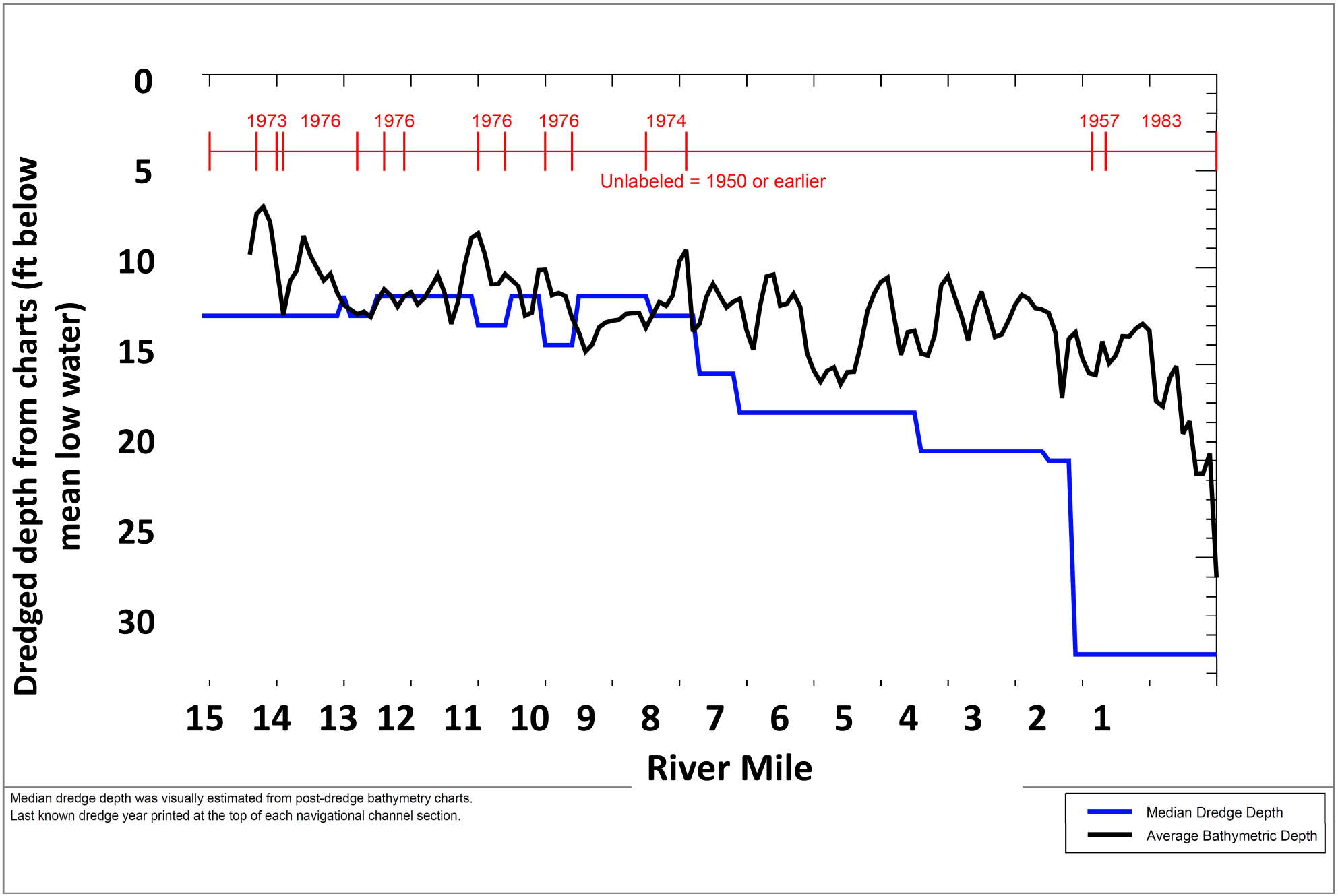
17-mile LPRSA
Refined Conceptual Site Model (CSM)
Considering Sediment Stability

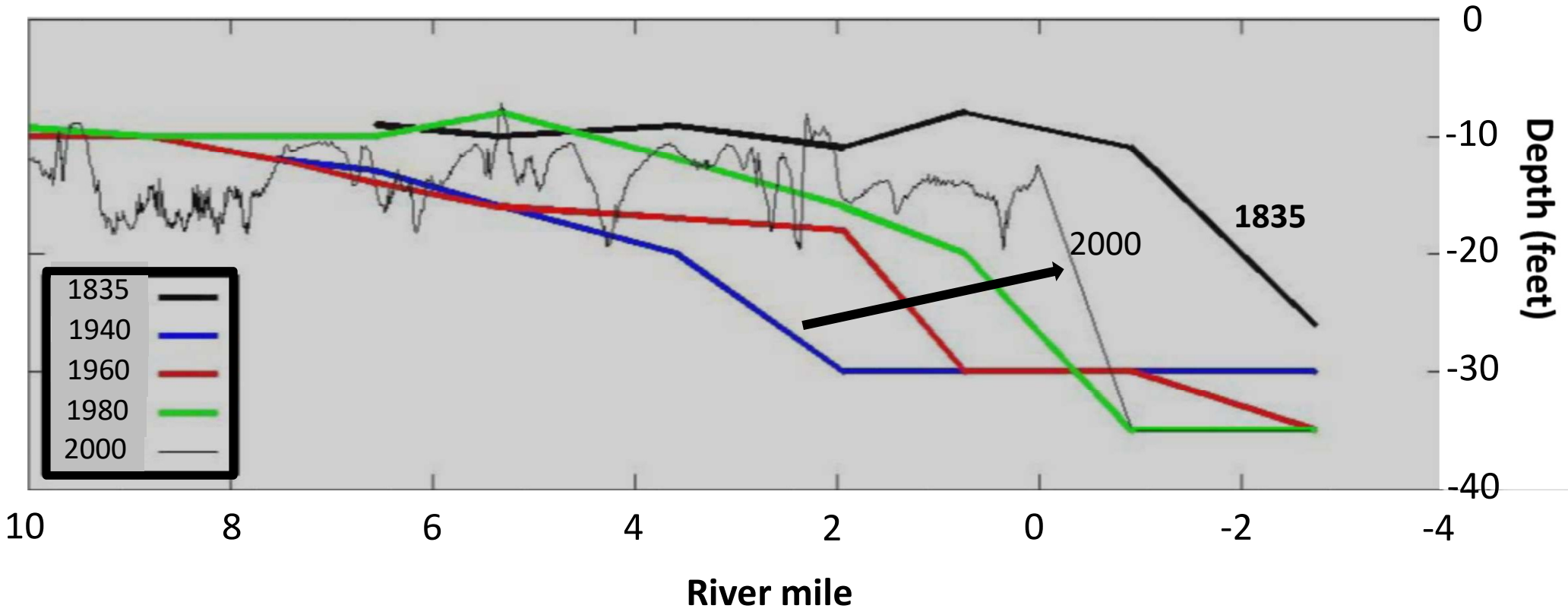
Source: Modified from U.S. EPA - Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, December 2005



Example of Water Circulation in the Lower Passaic River

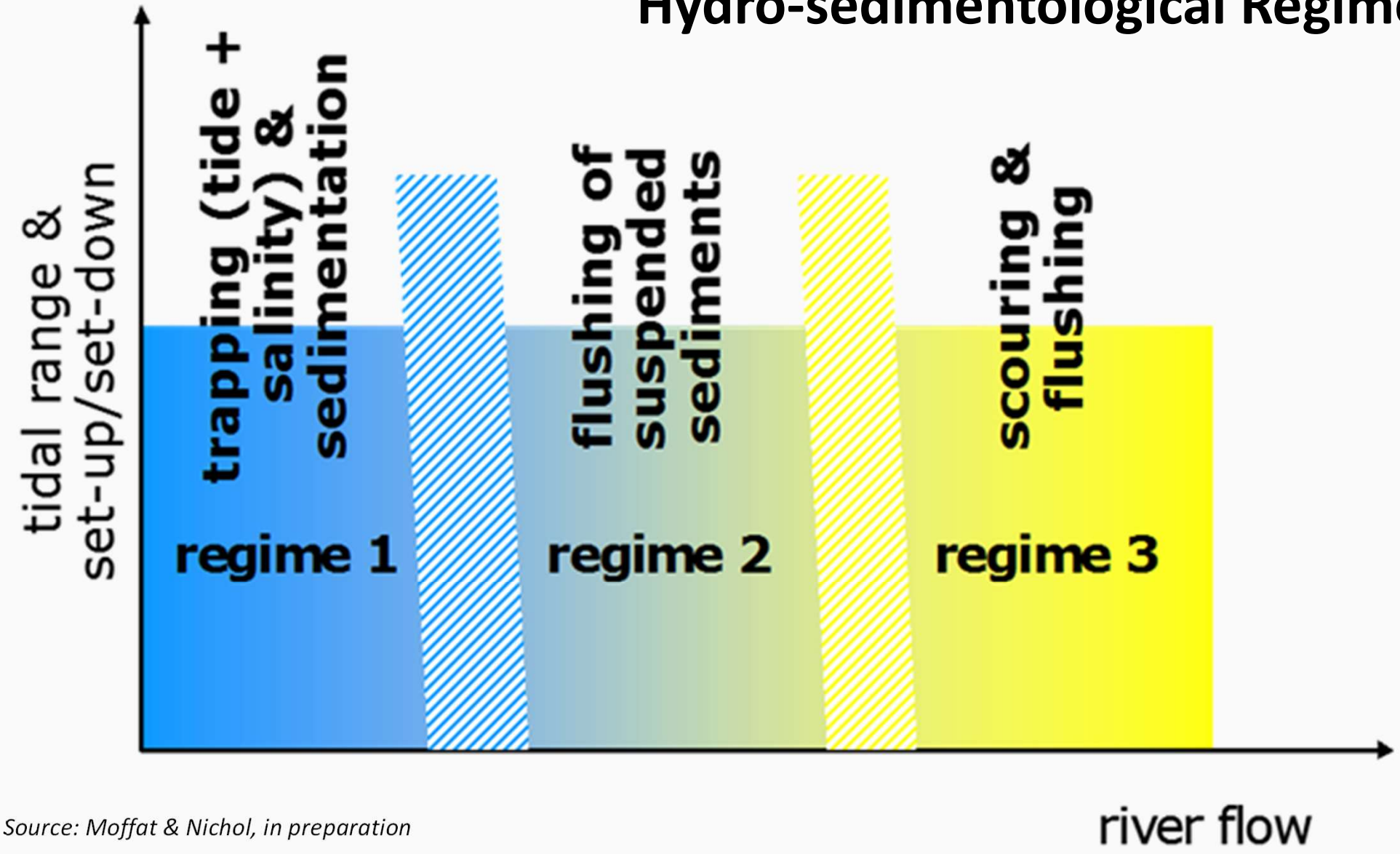



0
5
10
15
20
25
30
1973
1976
1976
1976
1976
1974
1957
1983
Unlabeled = 1950 or earlier
Dredged depth from charts (ft below mean low water)
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
River Mile
Median dredge depth was visually estimated from post-dredge bathymetry charts.
Last known dredge year printed at the top of each navigational channel section.
Median Dredge Depth
Average Bathymetric Depth

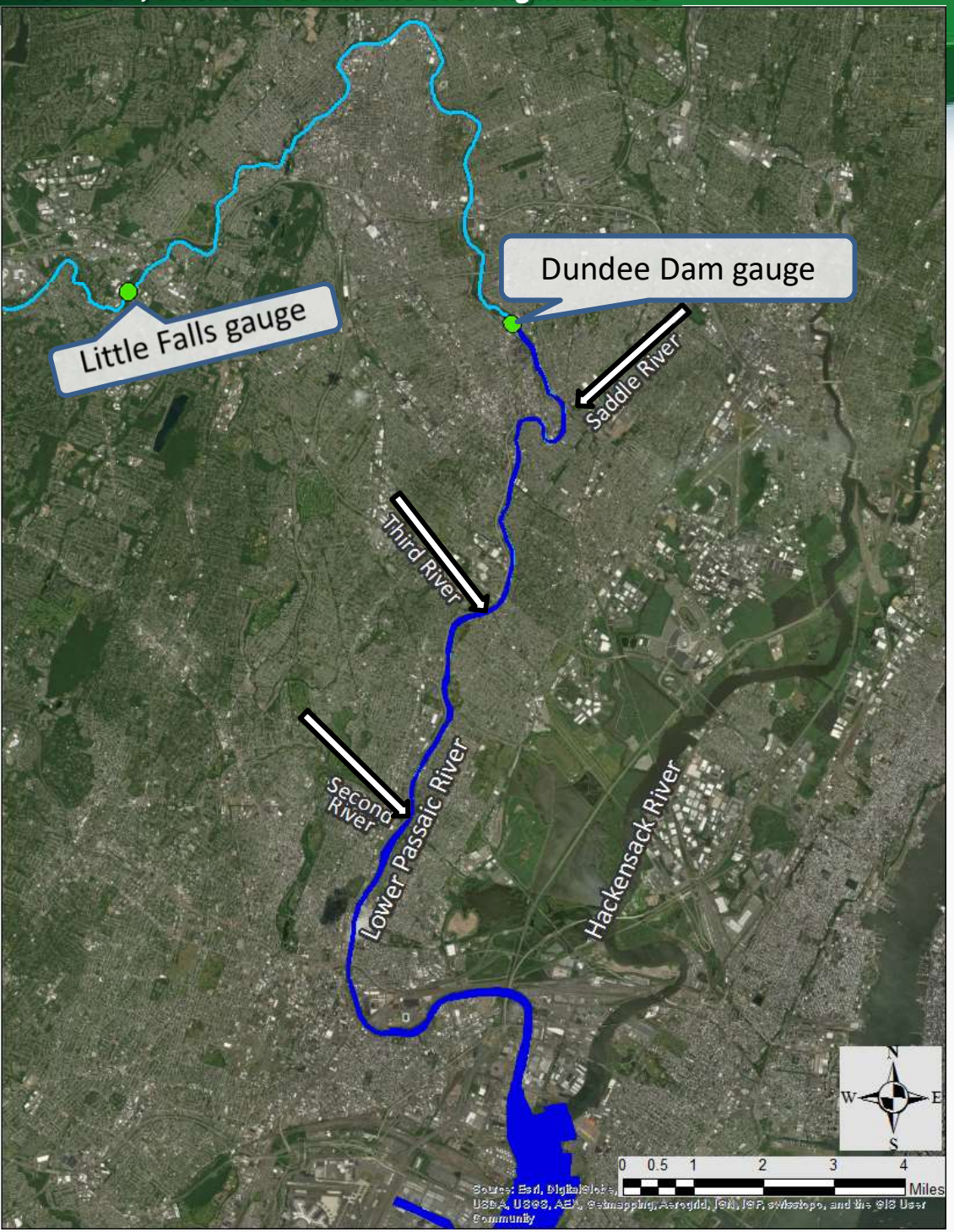


Source: Chant and Fugate, 2006

Hydro-sedimentological Regimes

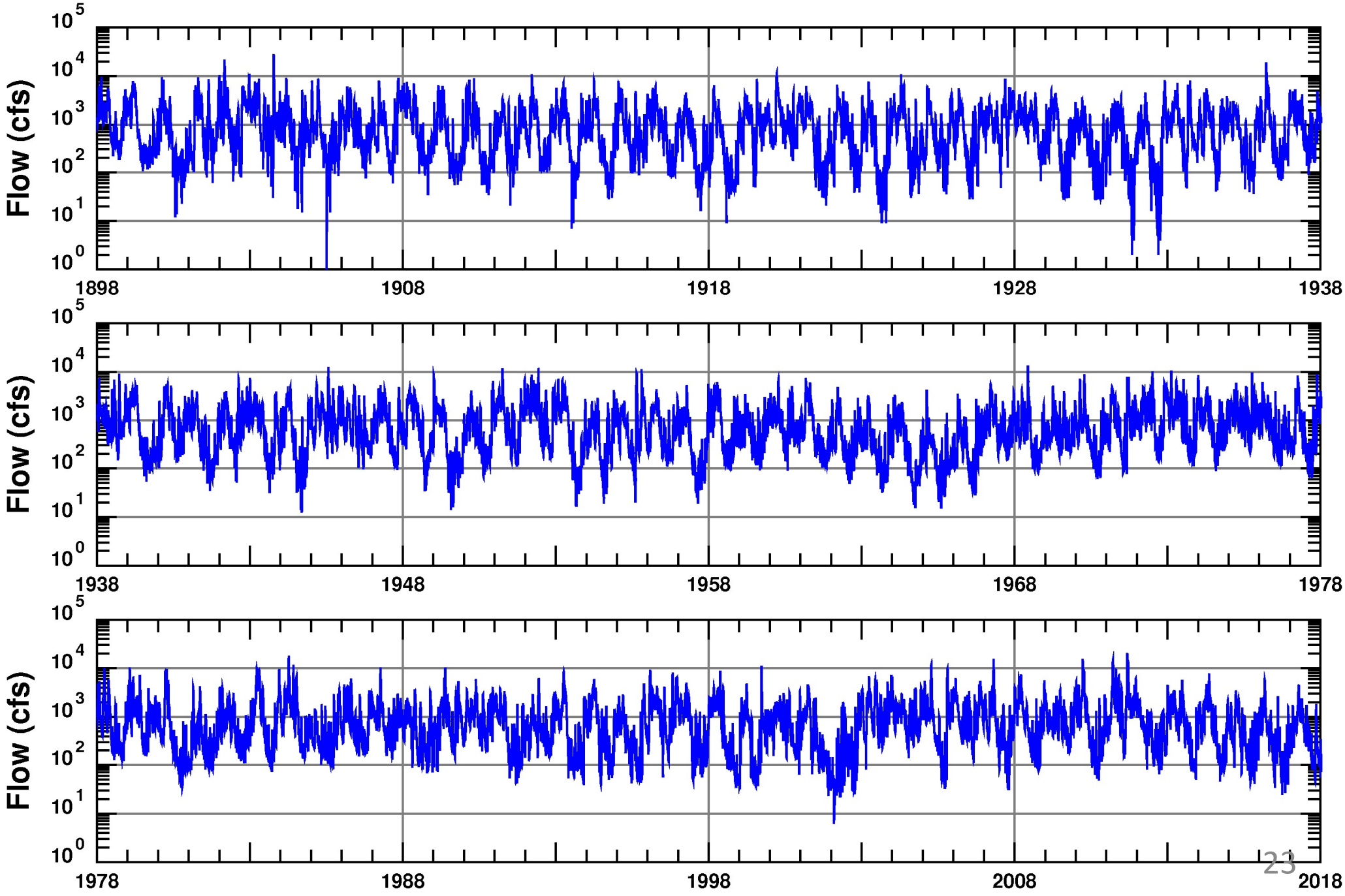


Source: Moffat & Nichol, in preparation

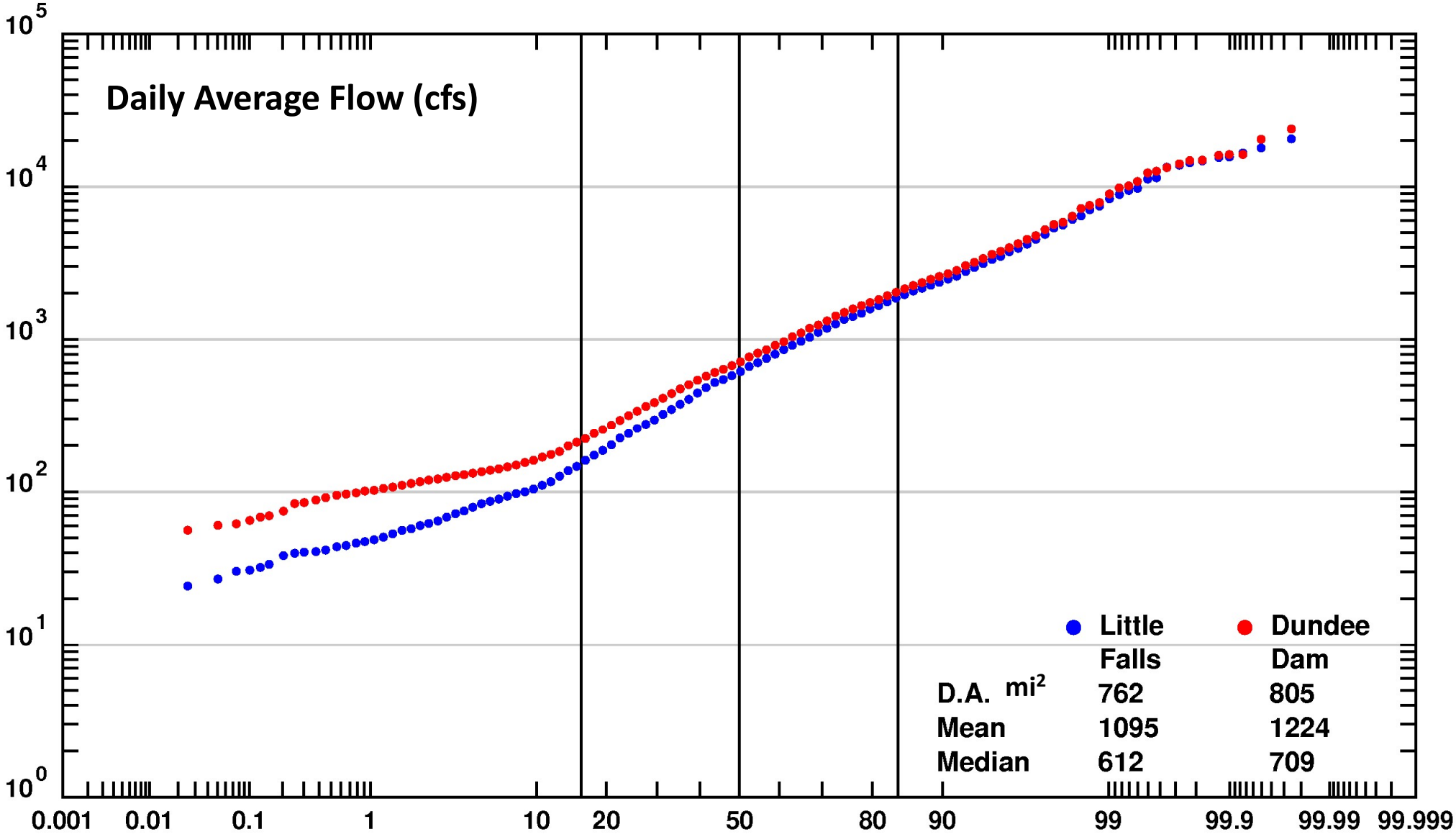


Flow Input	Average Flow (cfs)
Dundee Dam	1,315
Saddle River	117
Third River	12
Second River	15
LPR CSO/SW	16

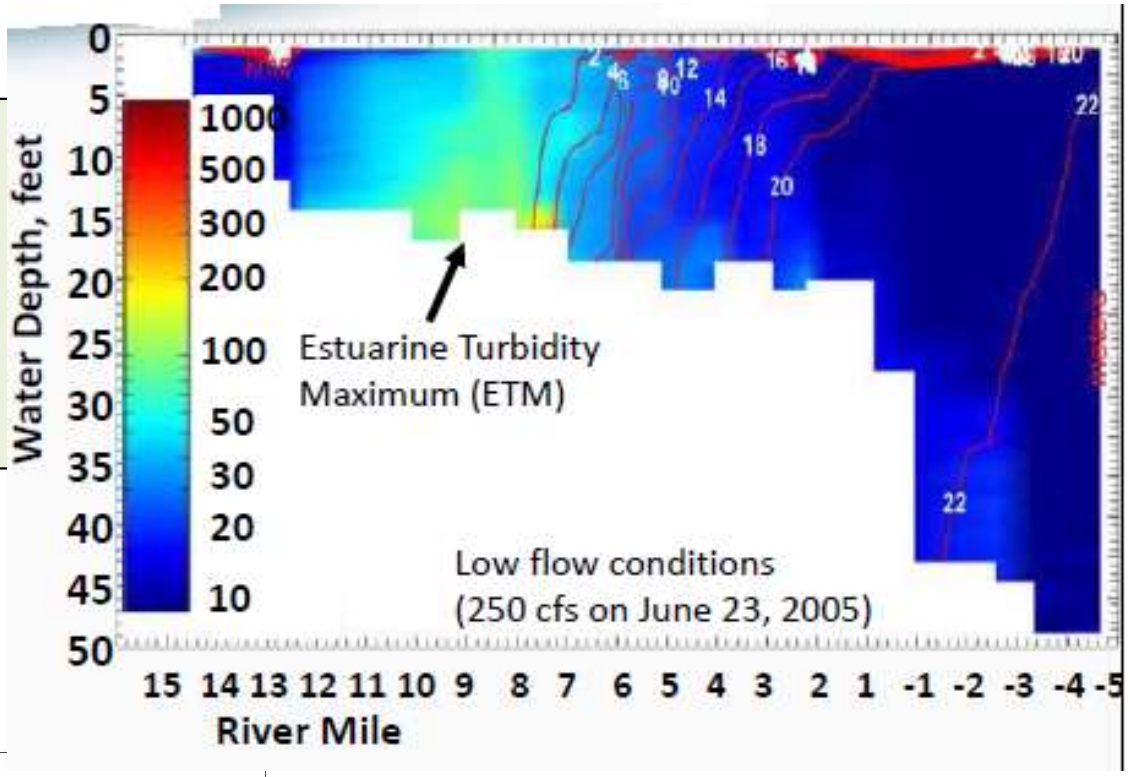
Average Daily Flow at Little Falls 1898 – 2017

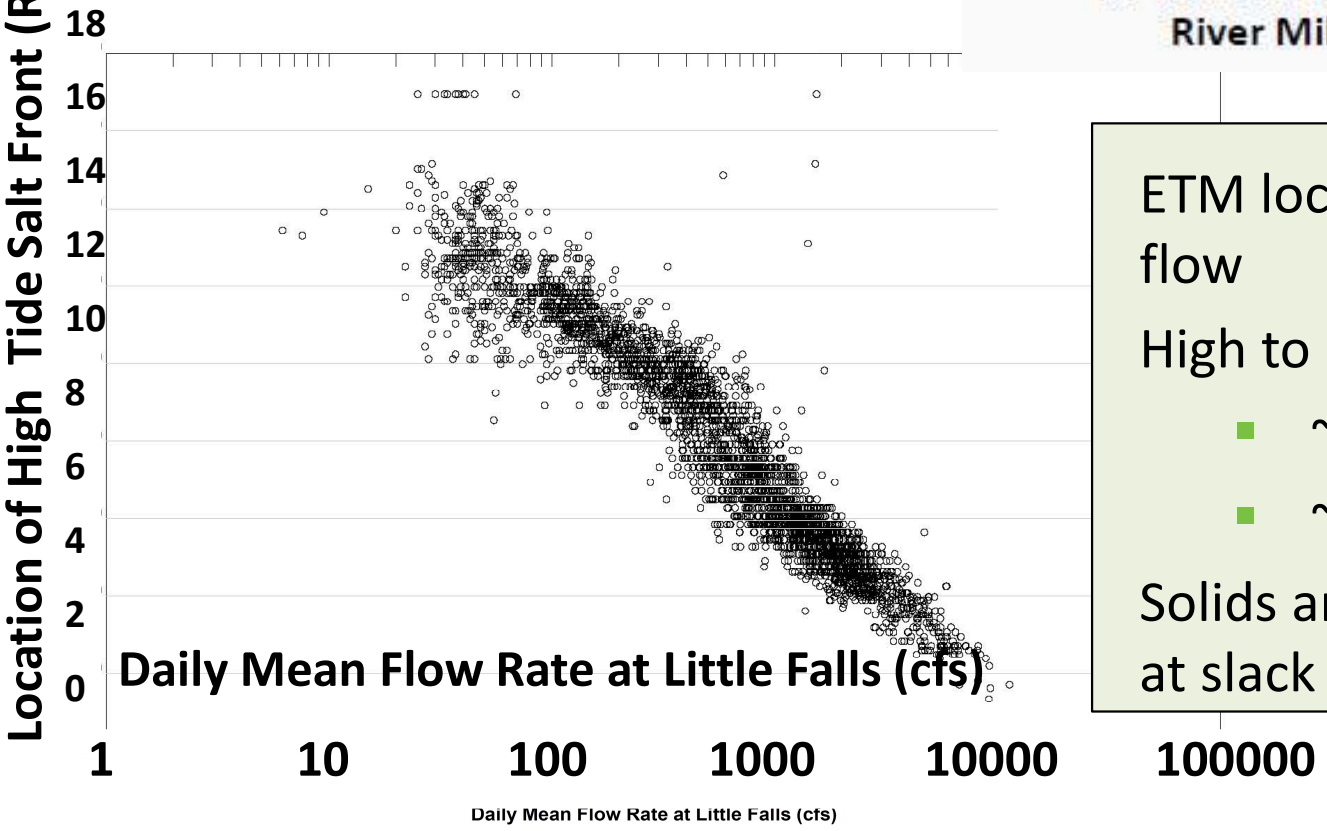


Comparison of Little Falls and Dundee Dam flow records



Estuarine turbidity maximum (ETM) generally located near upstream limit of 2 ppt isohaline (salt front)



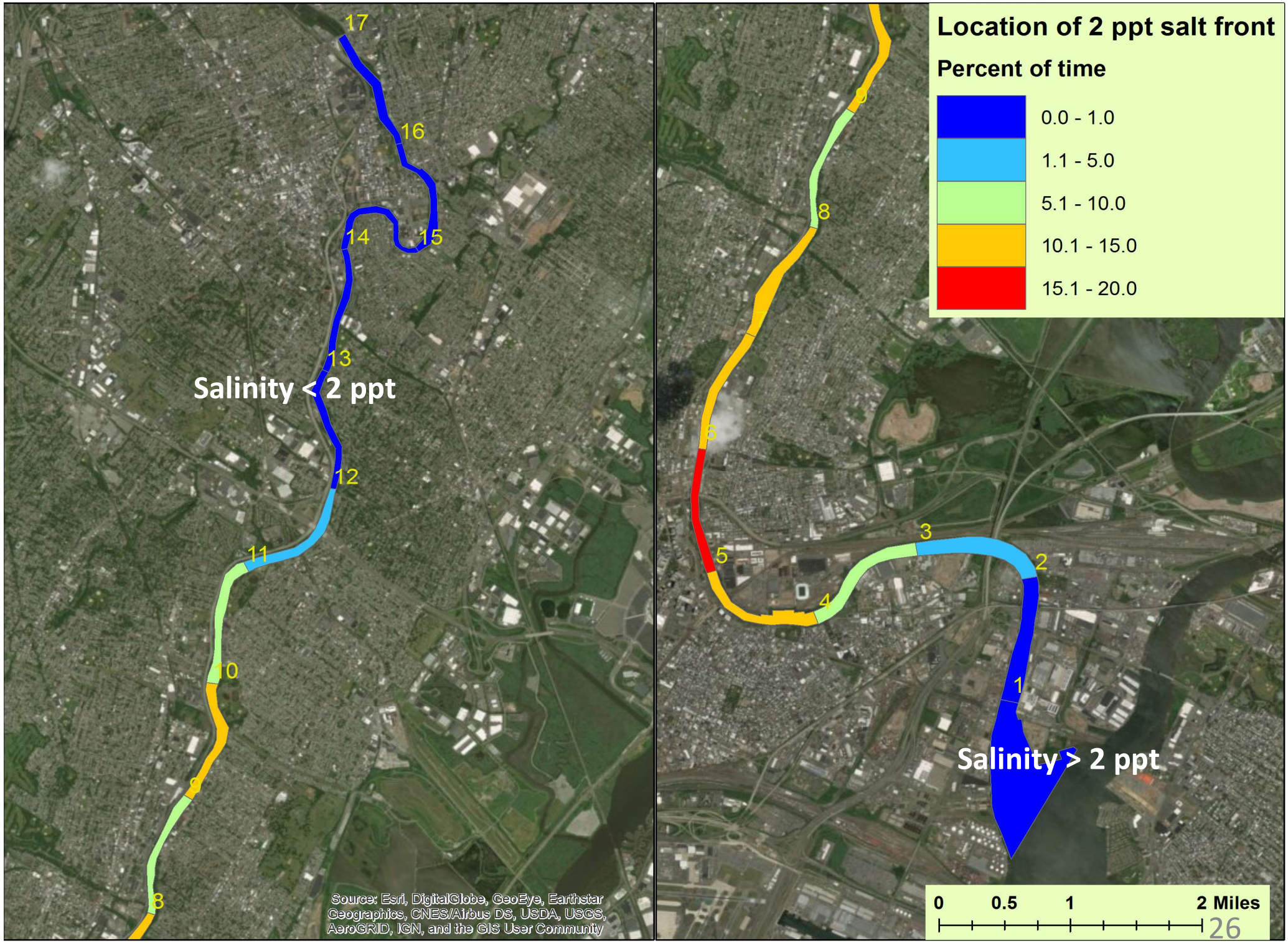


ETM location is a function of river flow

High to low tide movement

- ~ 4 miles – Spring tide
- ~ 2 mile – Neap tide

Solids and contaminant deposition at slack tide


Location of 2 ppt salt front
Percent of time
0.0 - 1.0
1.1 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Salinity < 2 ppt
Salinity > 2 ppt
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
0
0.5
1
2 Miles

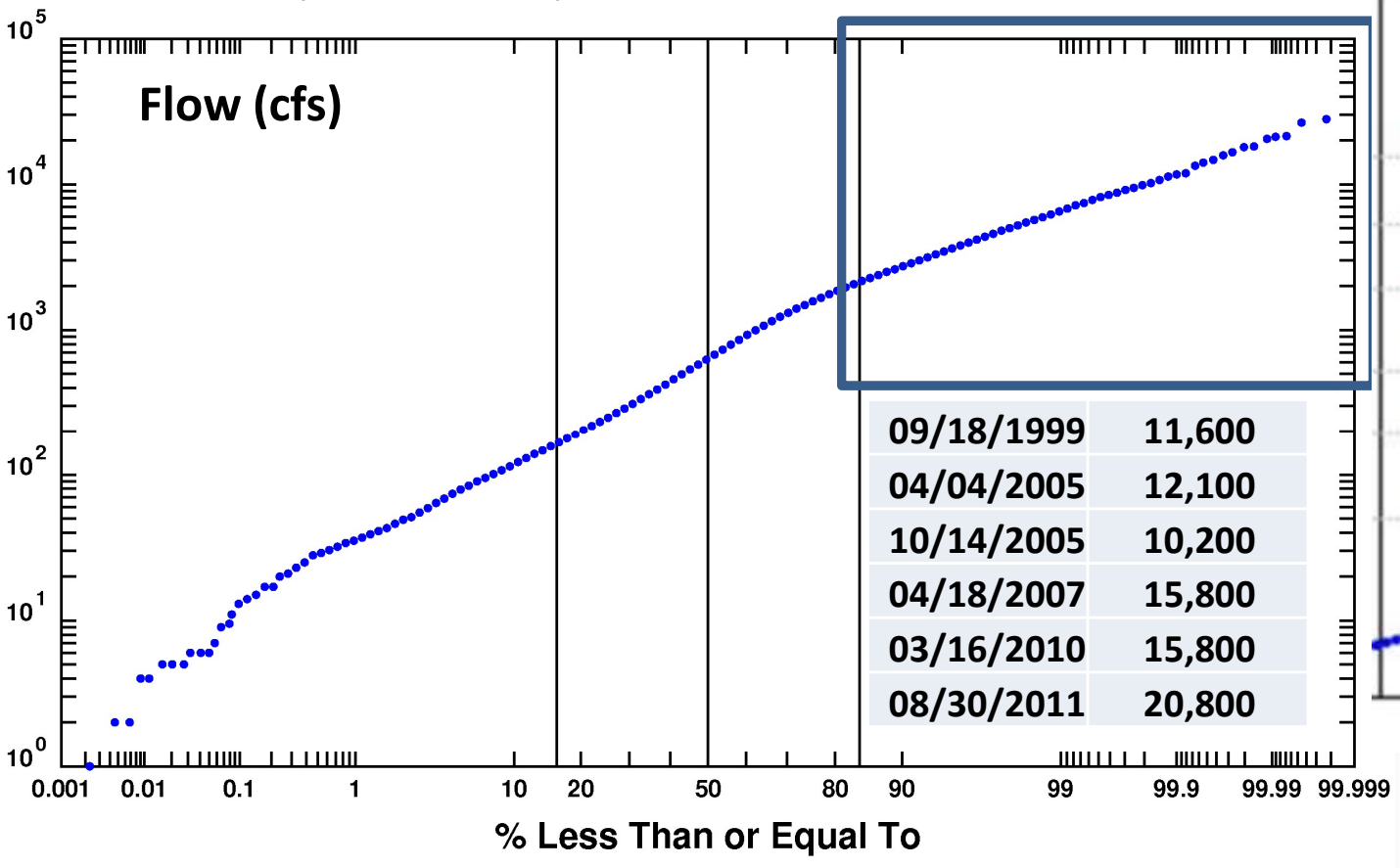
Return frequency of flood-flows at Little Falls

In last 20 years:

6 flows > 5-year Return period

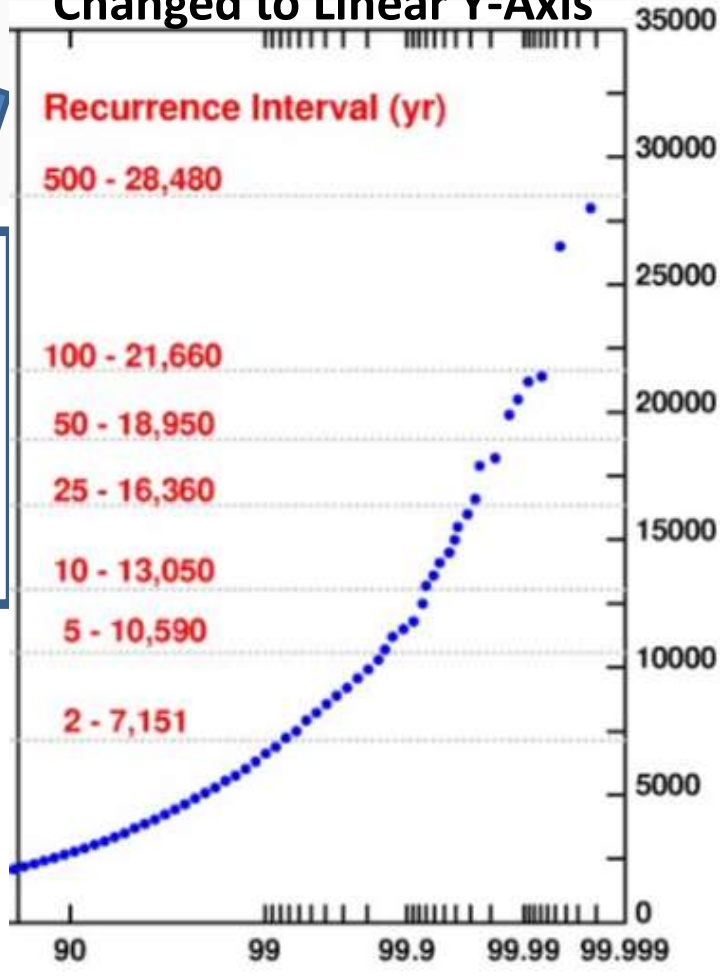
3 Flows >20-year Return period

1 Flow = 90-year Return period

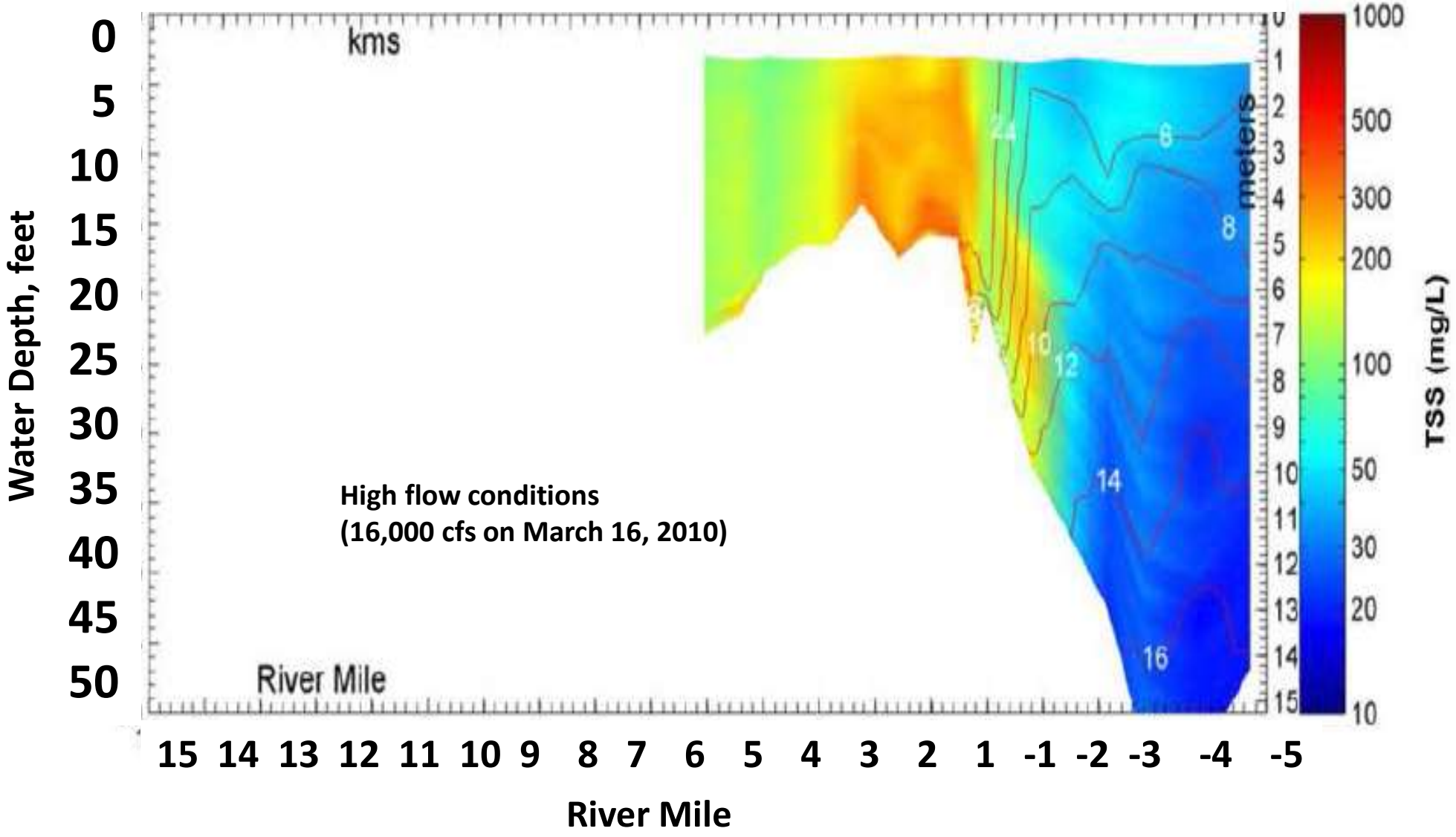


09/18/1999	11,600
04/04/2005	12,100
10/14/2005	10,200
04/18/2007	15,800
03/16/2010	15,800
08/30/2011	20,800

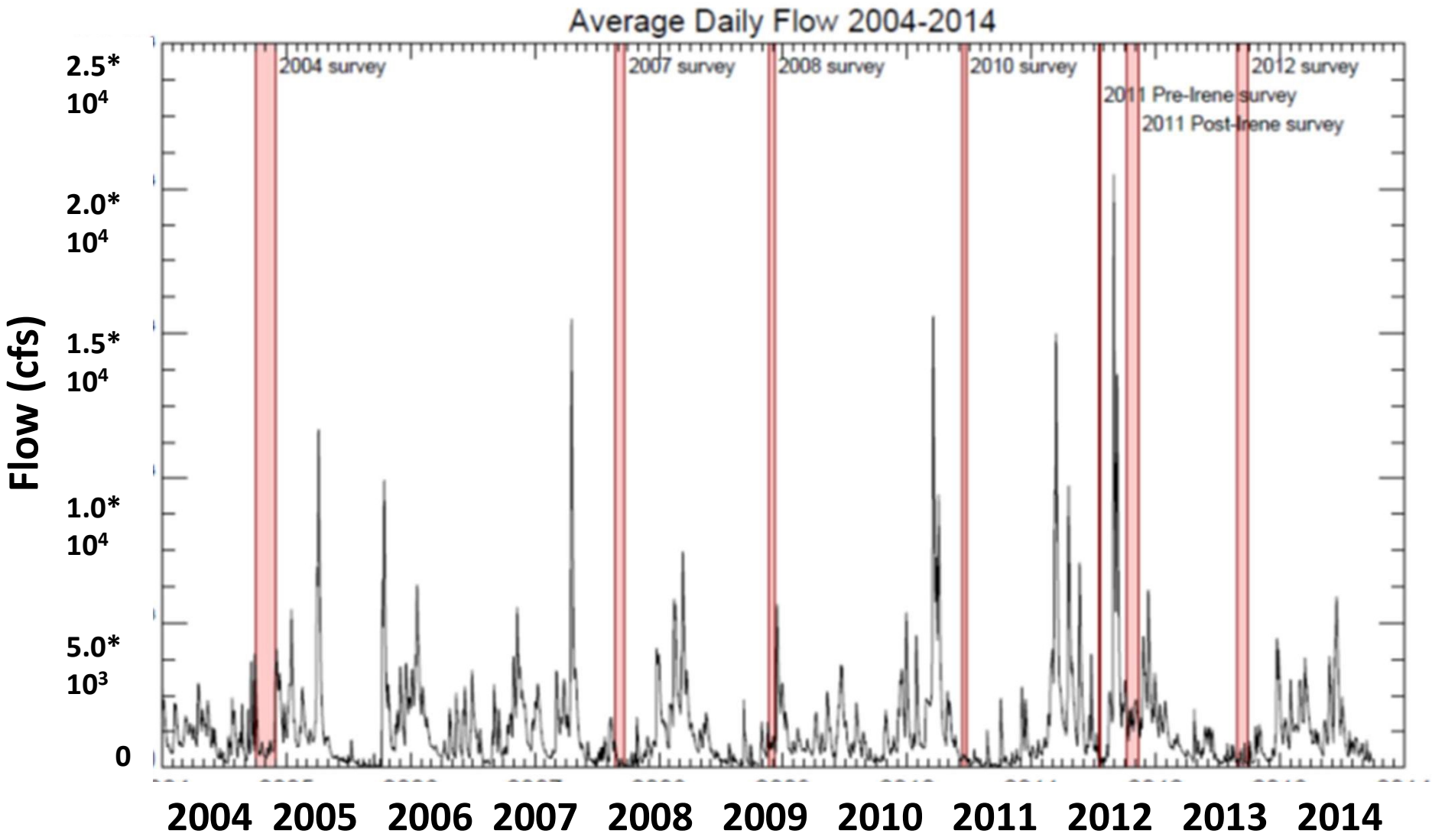
Changed to Linear Y-Axis



Bed erosion and solids export to Newark Bay during high-flow conditions (Elevated solids near RM 1 greater than inflow over Dundee Dam)

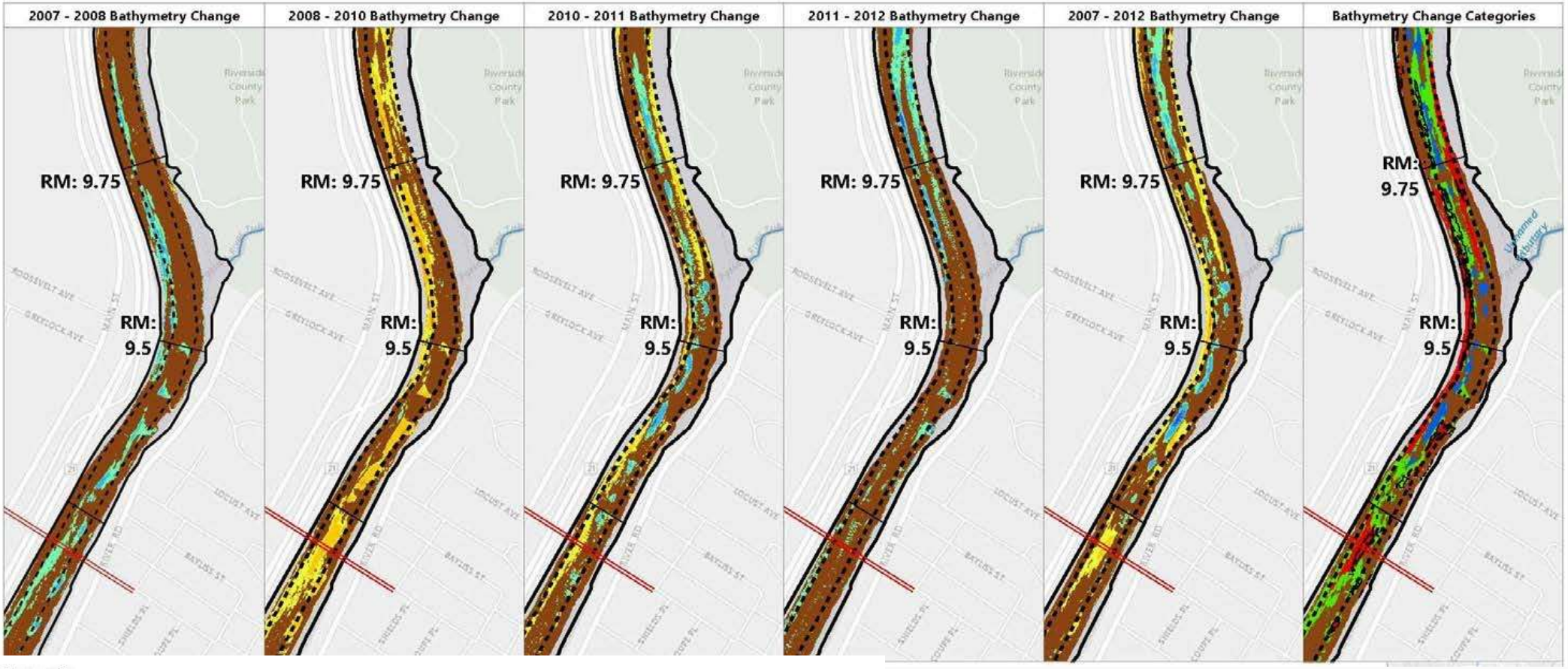


Average Daily Flow 2004 – 2014



Historical Flow Record at Little Falls and Dundee Dam with Bathymetry Survey Dates
(AQEA 2017 RI)

Bathymetry Evaluation – Erosion and Deposition over time



Legend:

- Subreach Boundary
- Navigational Channel
- Shoreline

Bathymetry Change (feet)

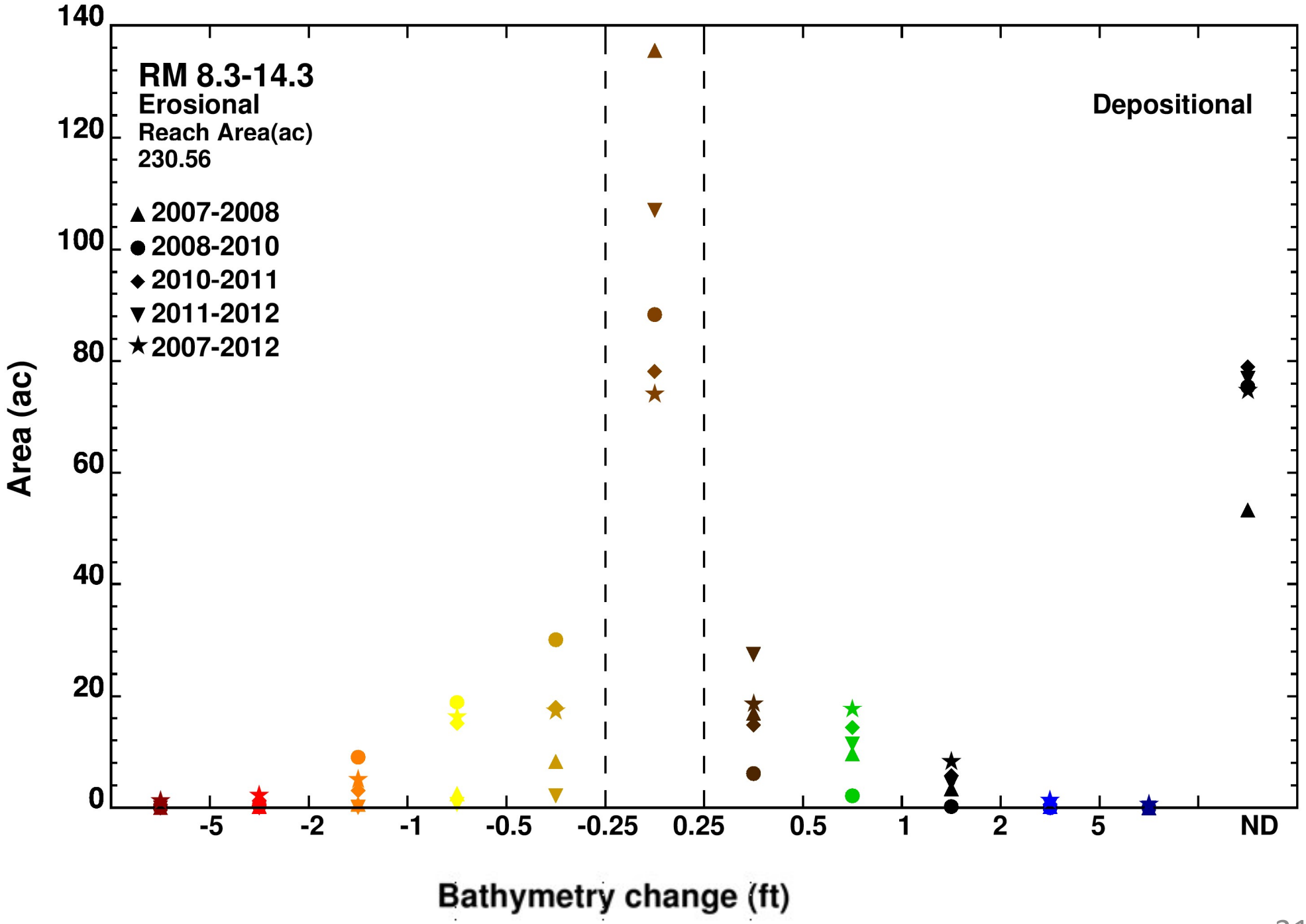
>5	-1 - -0.5
2 - 5	-2 - -1
1 - 2	-5 - -2
0.5 - 1	<-5
-0.5 - 0.5	

Bathymetric Change Categories

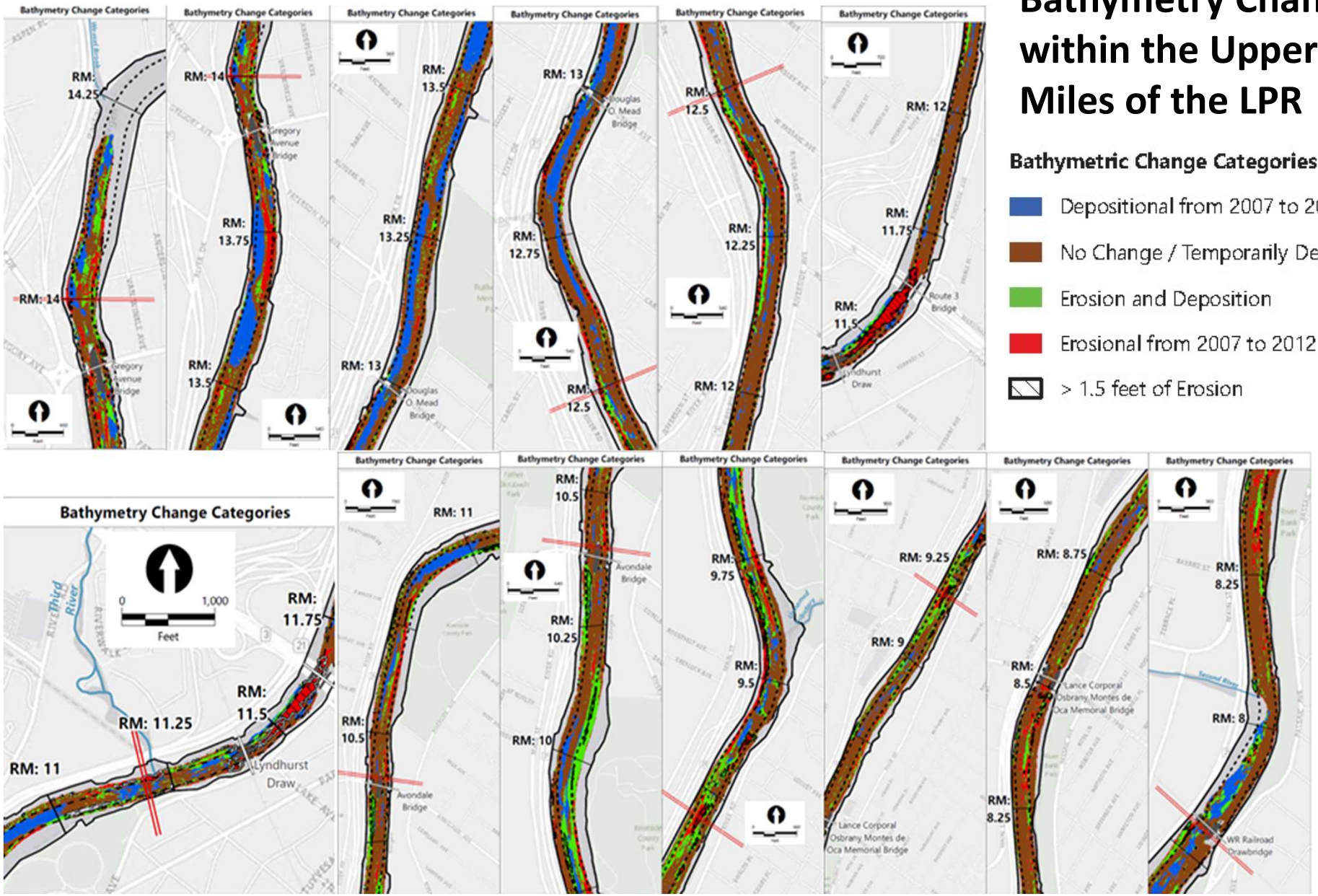
- Depositional from 2007 to 2012
- No Change / Temporarily Depositional
- Erosion and Deposition
- Erosional from 2007 to 2012
- > 1.5 feet of Erosion

NOTE(S):
Positive bathymetry change indicates deposition denoted in blue.
Negative numbers indicate erosion denoted in red.
Shoal bathymetry derived from single beam data for 2007, 2011 and 2012.

Source: LPRSA Draft RI Report, 12/17 (Anchor QEA, in preparation


RM 8.3-14.3
Erosional
Reach Area(ac)
230.56
2007-2008
2008-2010
2010-2011
2011-2012
2007-2012
Depositional
Area (ac)
140
120
100
80
60
40
20
0
-5
-2
-1
-0.5
-0.25
0.25
0.5
1
2
5
ND
Bathymetry change (ft)

Sediment Deposition and Erosion



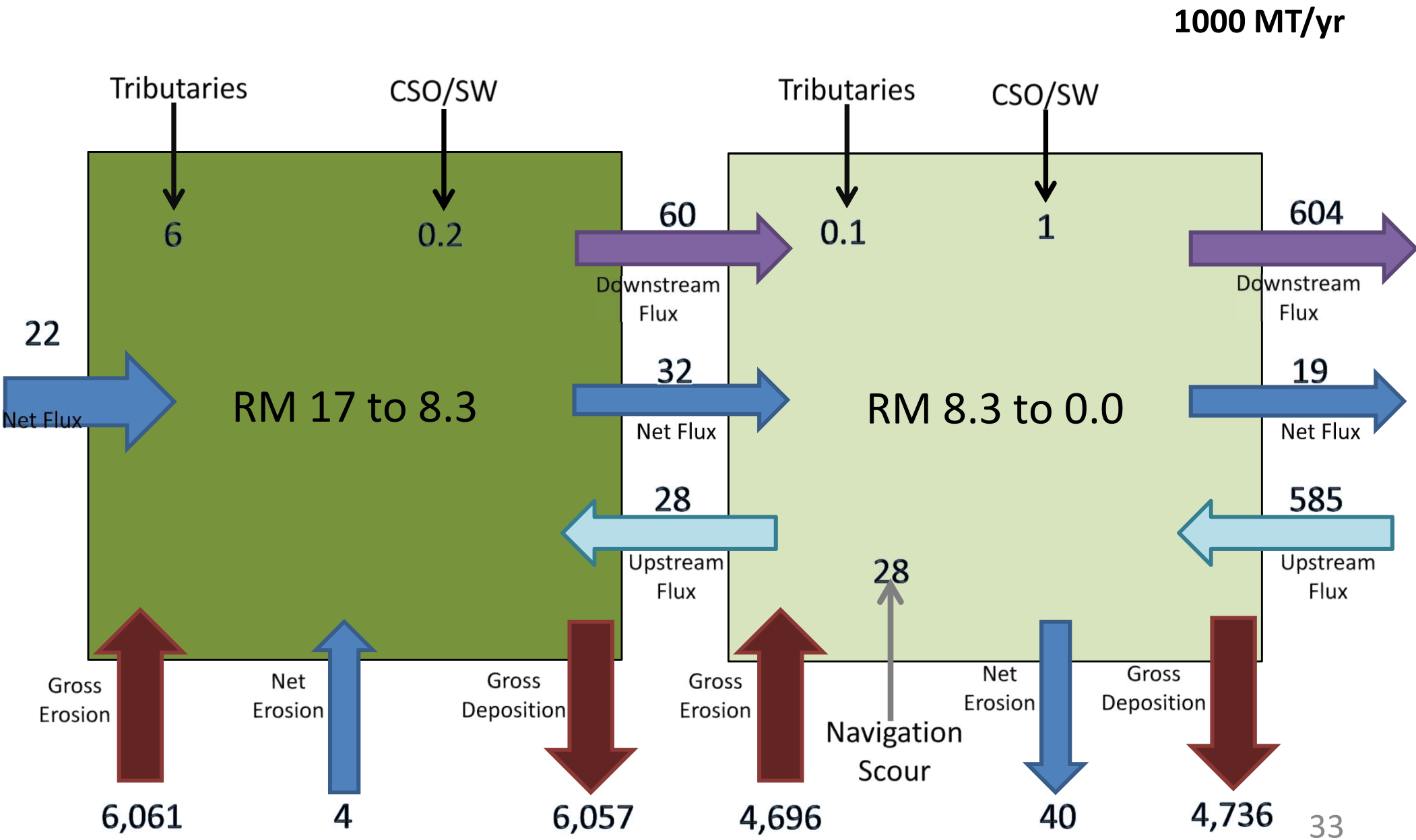
Bathymetry Changes within the Upper 9 Miles of the LPR

Bathymetric Change Categories

- Depositional from 2007 to 2012
- No Change / Temporarily Depositional
- Erosion and Deposition
- Erosional from 2007 to 2012
- > 1.5 feet of Erosion

Source: Anchor QEA in preparation

External and Internal Solids Movement (1996 – 2013)



Ongoing Contaminant Sources

- Primary Source
  - Internal sediment inventory
    - e.g., resuspended contaminated sediments within the LPR
    - contaminants generally associated with fines
- Secondary Sources
  - Tidal exchange with Newark Bay
  - Flows from above Dundee Dam
- Minor Sources
  - CSOs/SWOs, direct runoff, atmospheric deposition, etc.

Ongoing Contaminant Sources

	Upper Passaic River	Newark Bay	Tributaries	CSOs-SWOs	Lower Passaic River Resuspension
Solids	32	14	6	1	48
2,3,7,8-TCDD	0	3	0	0	97
Total TCDD	3	5	0	0	92
Total PCBs	11	6	1	0	81
DDE	10	8	3	1	78
Copper	14	12	1	1	72
Mercury	11	14	0	0	75
Lead	19	7	2	2	71
Benzo(a)pyrene	53	7	5	1	33
Fluoranthene	47	5	6	2	40

Notes

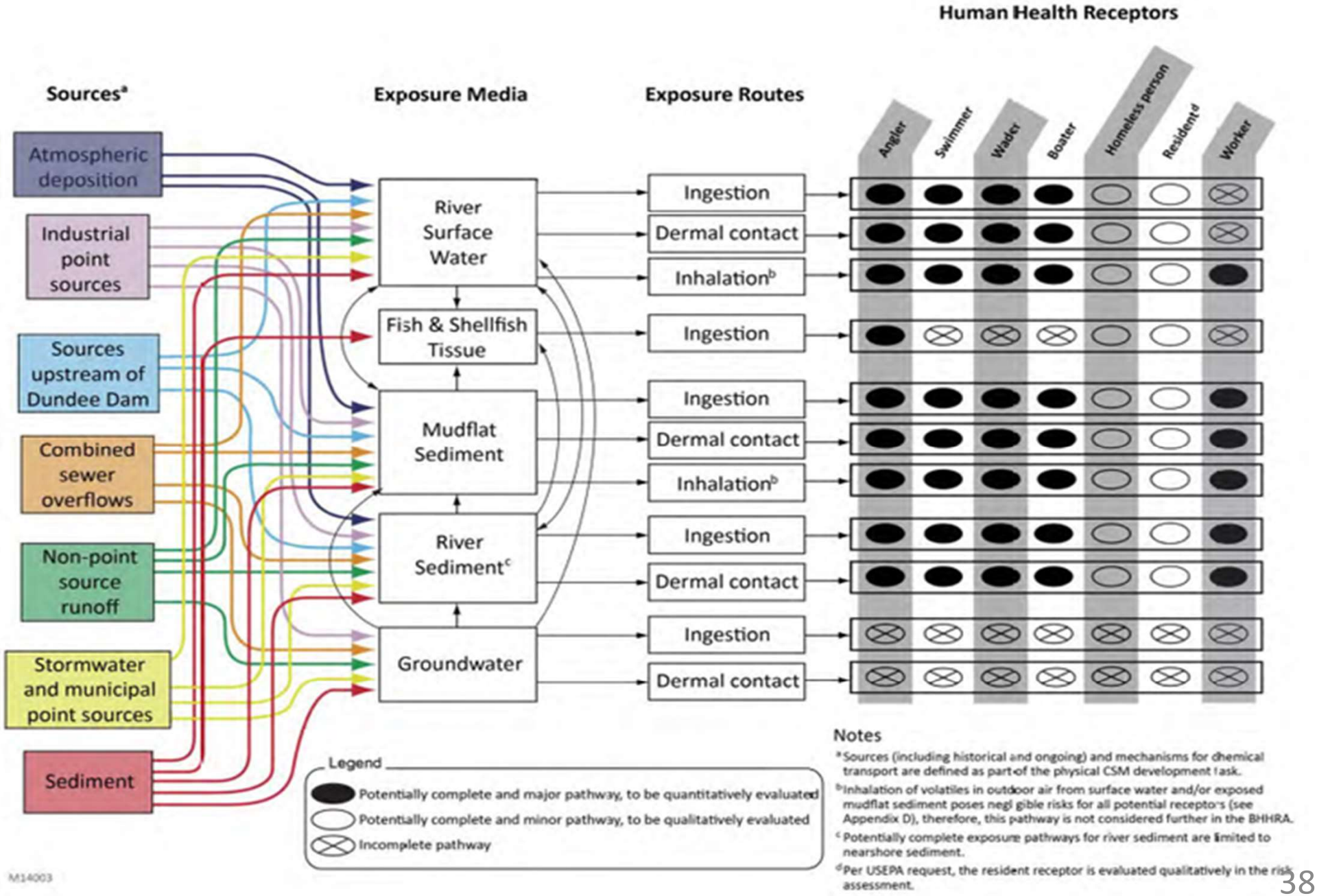
All numbers represent percent of total mass for each contaminant.
Benzo(a)pyrene and Fluoranthene are PAHs.

CSM Summary

- Navigation dredging and subsequent infilling created a "settling basin" for solids and contaminants
- Estuarine circulation enhances retention of solids and contaminants
- Estuarine circulation transports resuspended solids and contaminants over long stretches of the LPR
  - Function of freshwater flow and daily tidal excursions (high – low tide)
- Data collected over last decade reflect effects of relatively rare flow conditions
- Sequential bathymetry surveys document response of sediment bed to varying flow conditions
- Primary source of contaminant inputs to the water column is resuspension of in-place sediments

Overview of Human Health and Ecological Risks

General Human Health CSM (AECOM 2017)



Human Health Risk Assessment - Conclusions

- **Chemicals of Concern:** primarily dioxins and PCBs
- **Receptors**: young child, adolescent, and adult
- **Fish**: fillets of common carp, white perch, American eel, catfish, and largemouth/smallmouth bass
- **Crab**: muscle and hepatopancreas

Receptors	Cancer Risks	Non-Cancer Hazards	Cancer Risks	Non-Cancer Hazards
	Fish Consumption		Crab Consumption	
Young Child	1 x 10-3	193	4 x 10-4	50
Adolescent	2 x 10-3	127	5 x 10-4	33
Adult	3 x 10-3	123	9 x 10-4	32
Adult/Child	4 x 10-3	---	1 x 10-3	---

General Ecological CSM

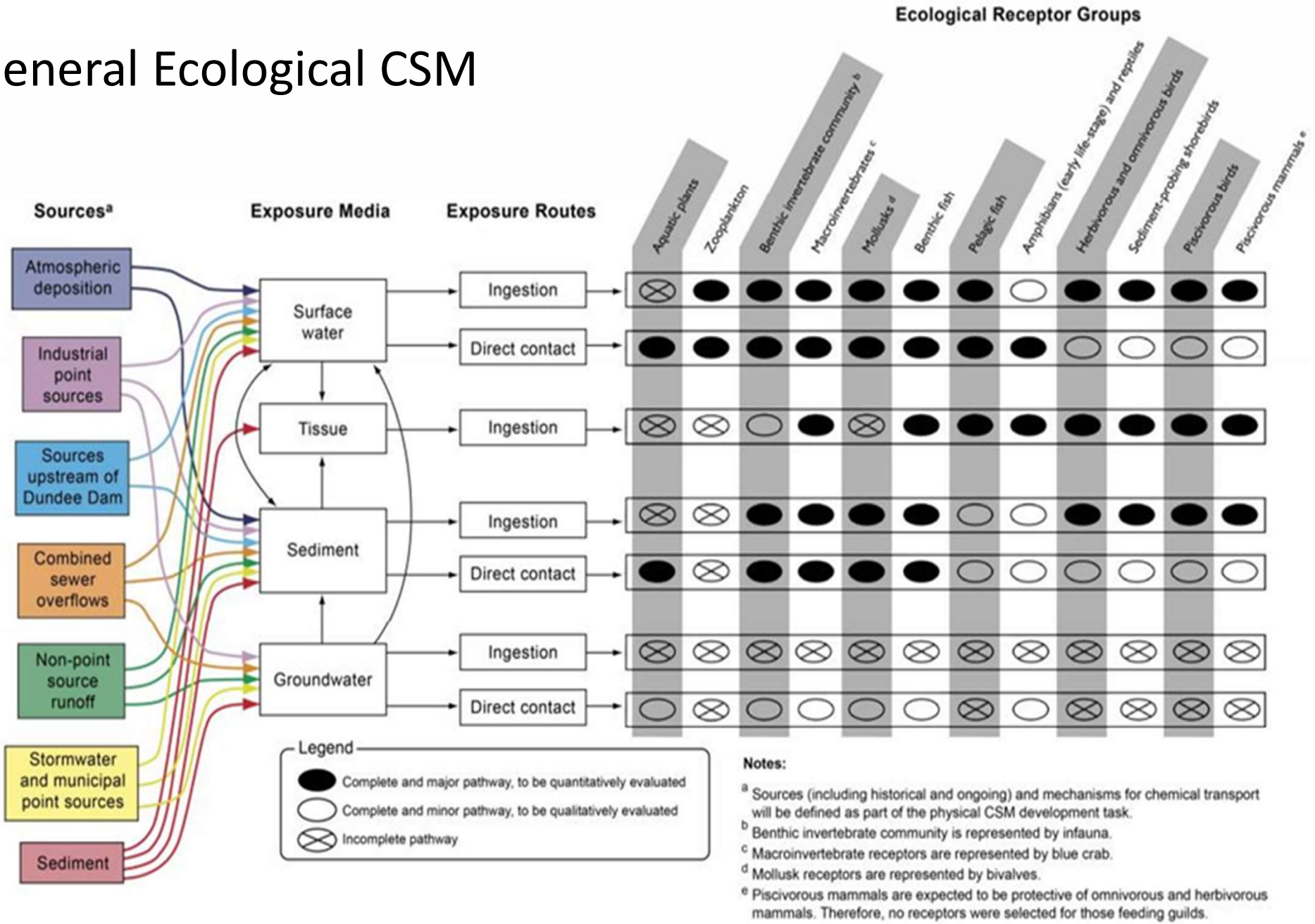


Figure 3-1. General ecological CSM for the LPRSA

(Windward, [Draft] 2017)

Ecological Risk

- Revised Draft Baseline Ecological Risk Assessment submitted 12/17
- Preliminary findings currently under review by EPA:
  - **Benthic invertebrates** (including crabs and mussels) are at risk from elevated dioxins, PCBs, PAHs, pesticides, and metals in sediment.
  - **Fish** (omnivores, invertivores, and piscivores) are at risk through fish tissue, fish eggs, dietary dose, and surface water exposure to dioxins, PCBs, pesticides, and metals in surface water.
  - **Birds** (sandpiper, heron, and kingfisher) are at risk through dietary dose and egg tissue exposure to dioxins, PCBs, PAHs, pesticides, and metals in sediment.
  - **Mammals** (river otter and mink) are at risk through dietary dose exposure to dioxins, and PCBs in sediment.

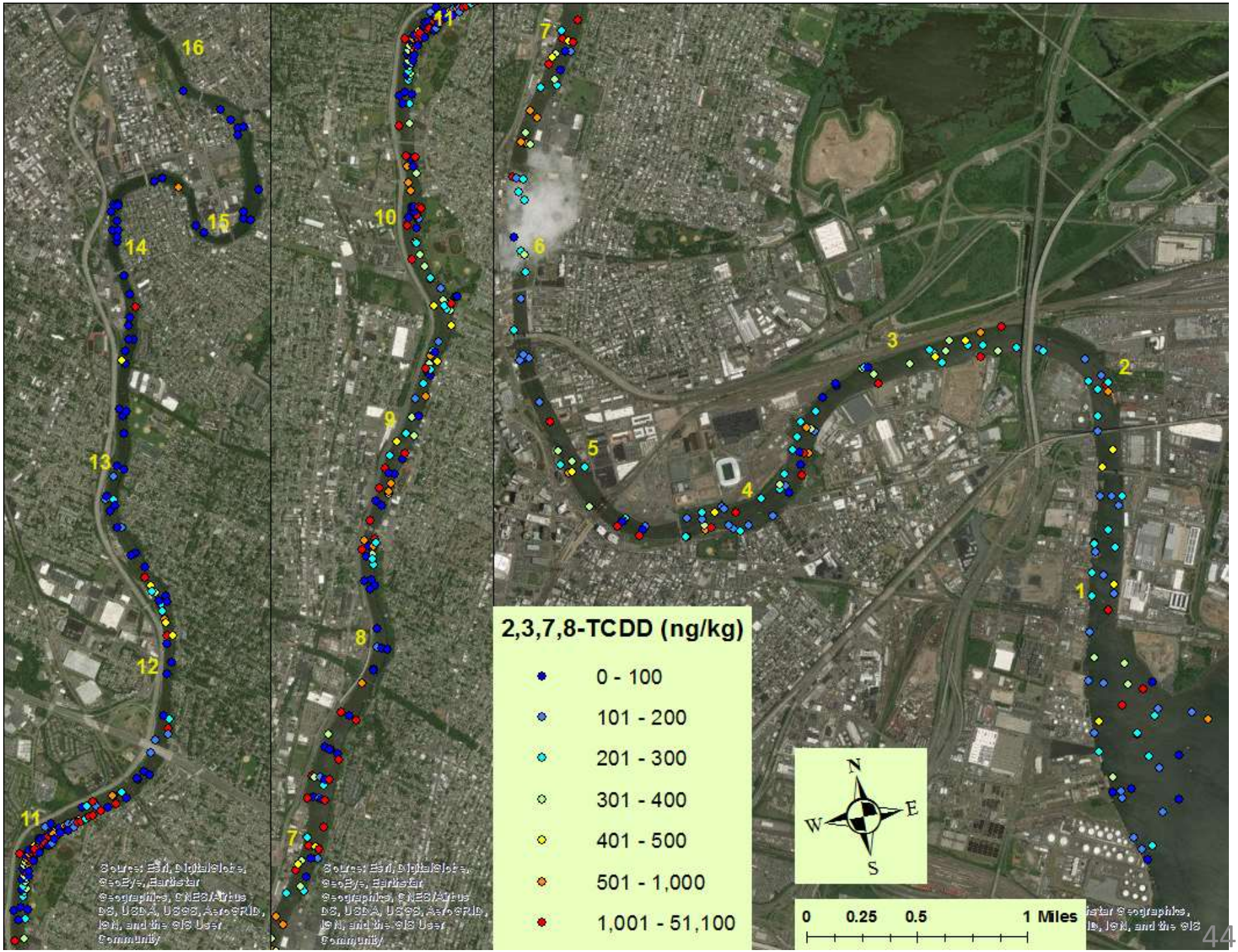
Ecological Risk

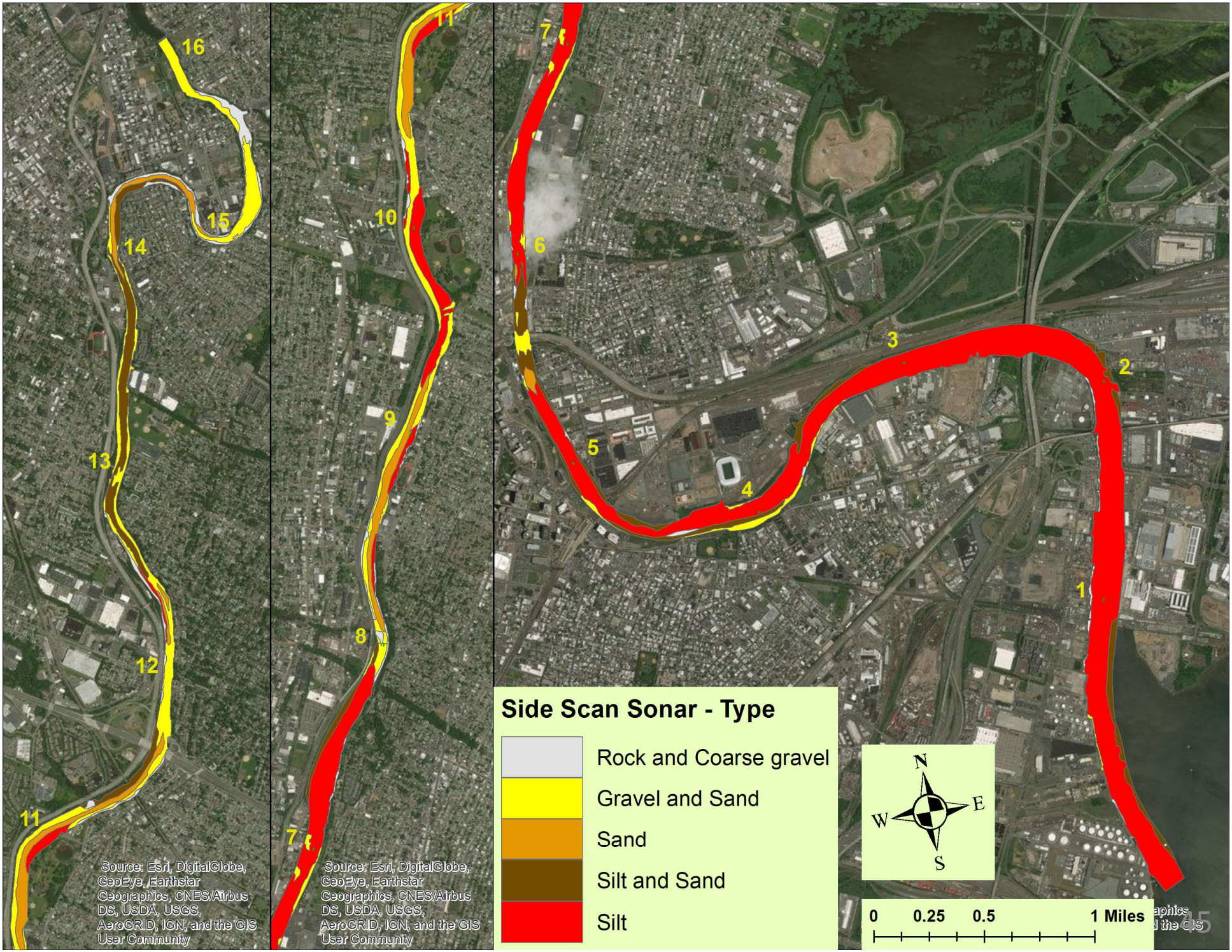
The Revised BERA (Revision 2) states that the contaminants that contribute the greatest ecological risk are:

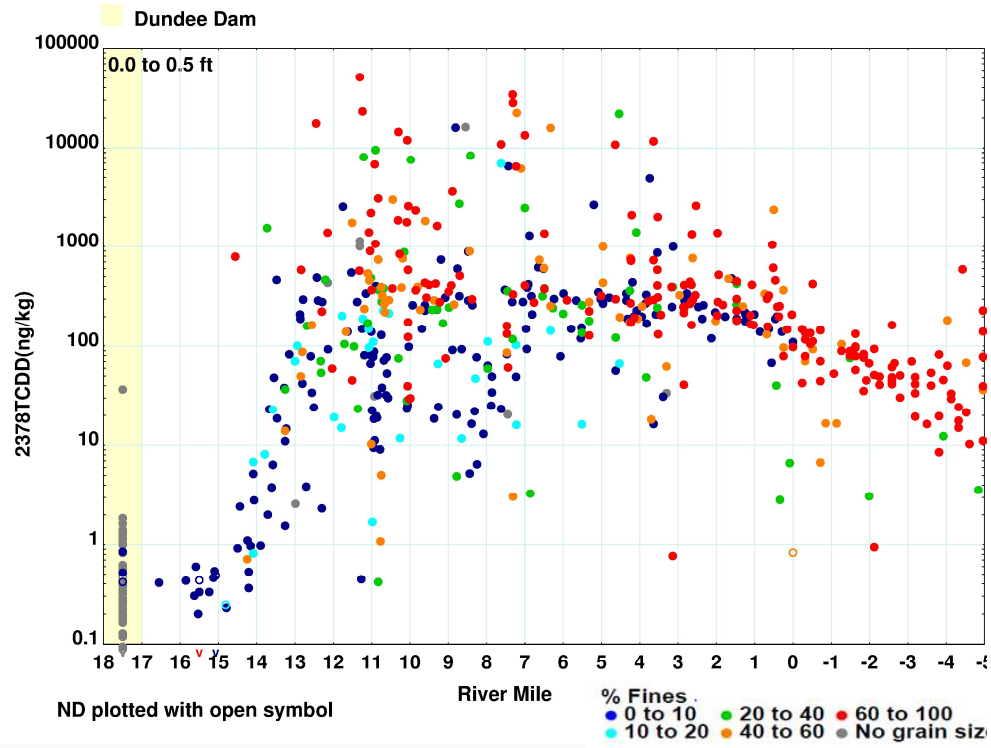
- 2,3,7,8-TCDD
- PCDD/PCDF TEQ (based on fish-TEQ, bird-TEQ, and mammal-TEQ)
- Total TEQ (based on fish-TEQ, bird-TEQ, and mammal-TEQ)
- Total PCBs
- PCB (based on fish-TEQ, bird-TEQ, and mammal-TEQ)
- Total DDx

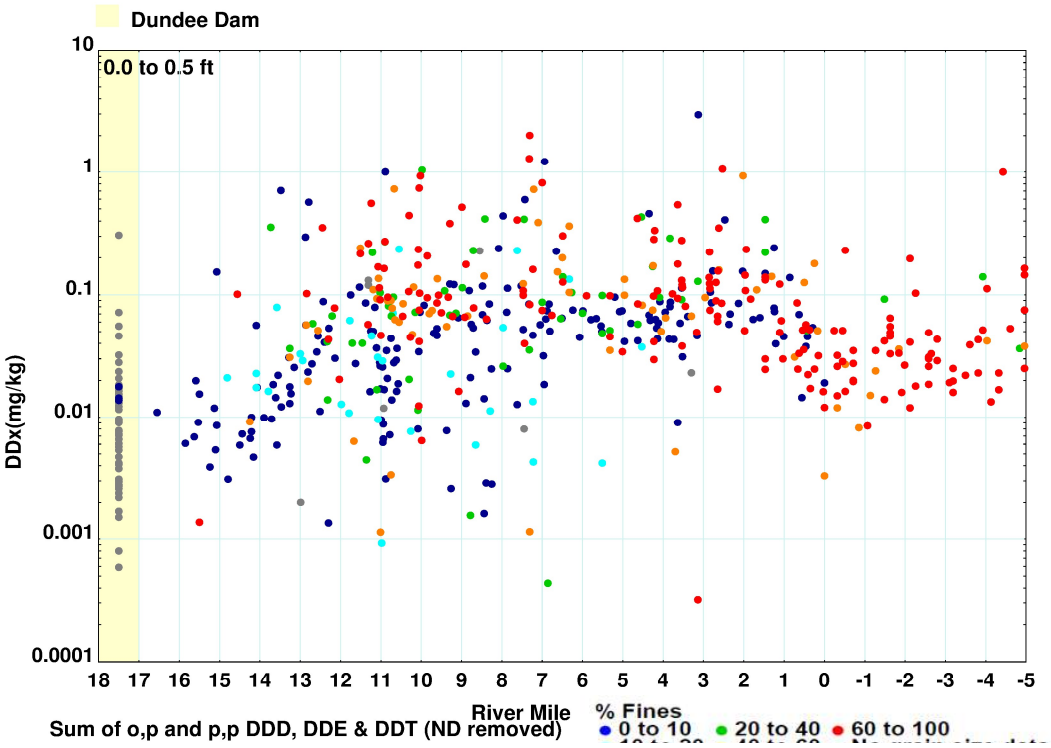
Source: LPRSA Draft Baseline Ecological Risk Assessment (Windward Environmental LLC in preparation)

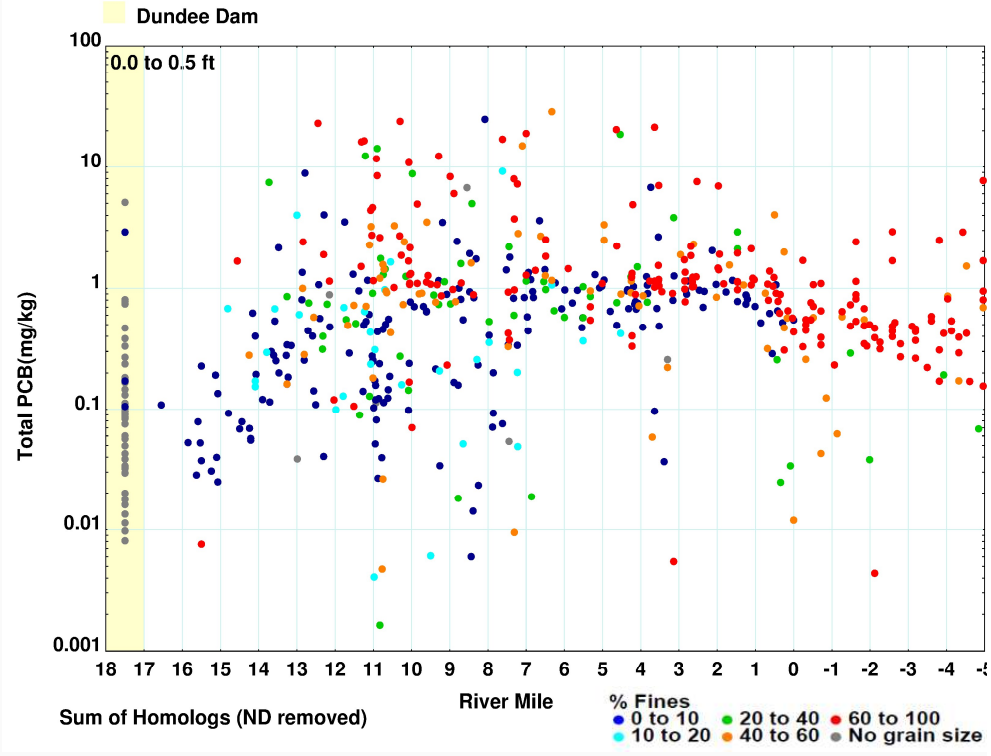
Overview of Surface Contaminant Trends

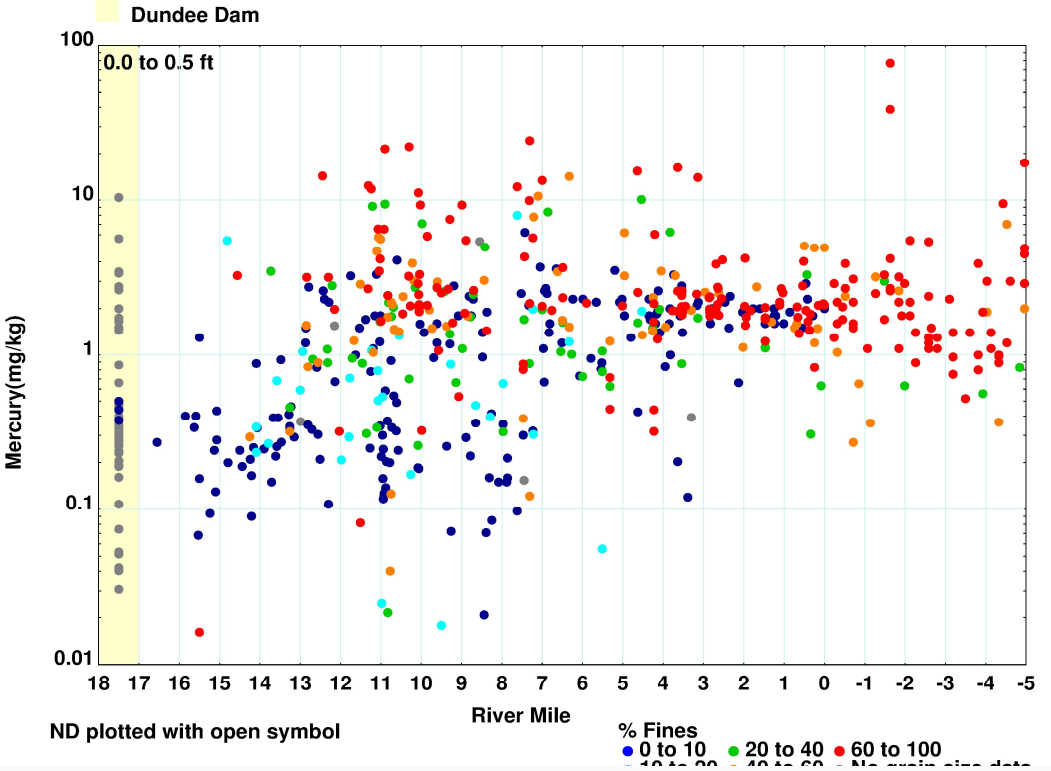

2,3,7,8-TCDD (ng/kg)
0 - 100
101 - 200
201 - 300
301 - 400
401 - 500
501 - 1,000
1,001 - 51,100
N
W
E
S
0
0.25
0.5
1 Miles
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

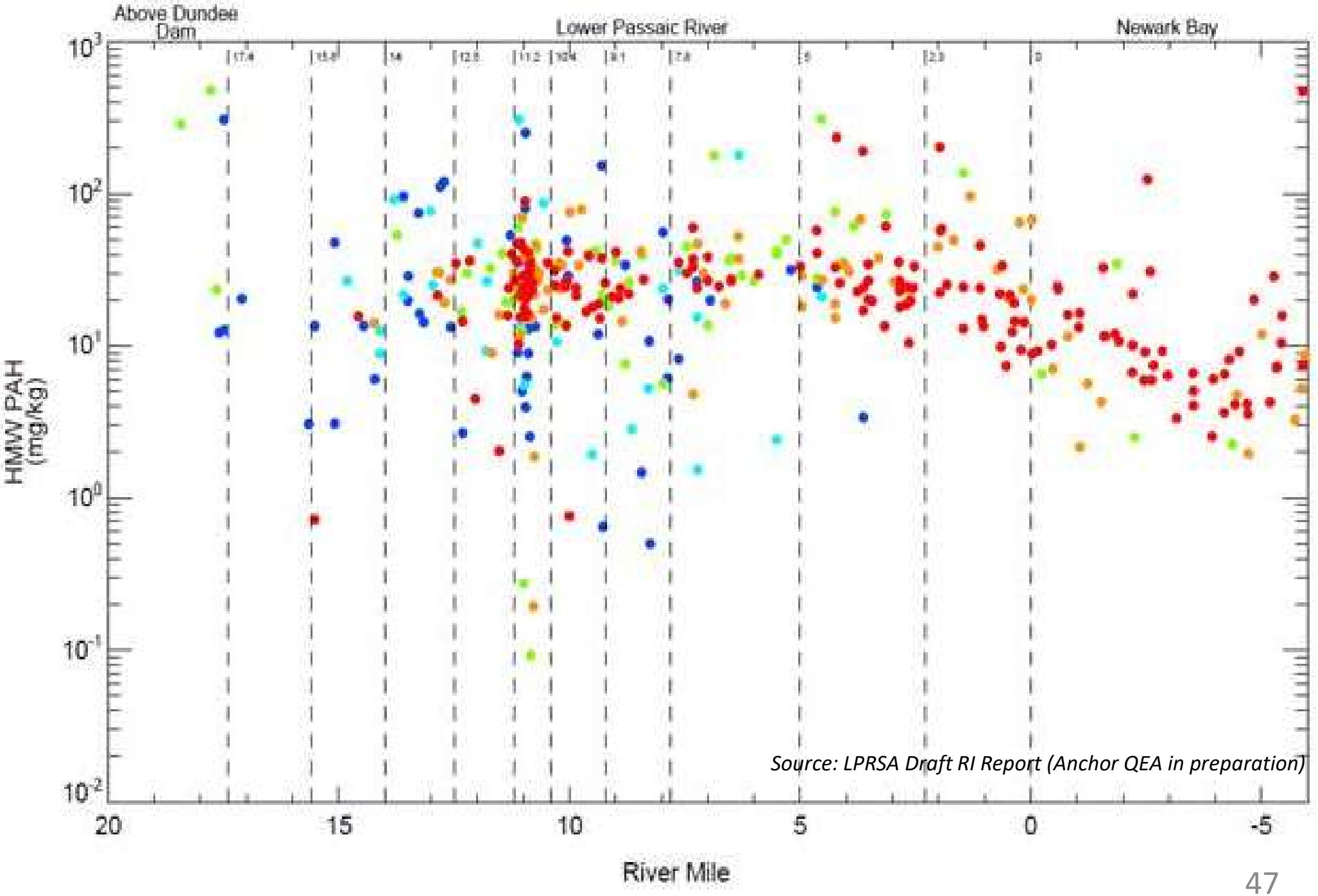

16
15
14
13
12
11
11
10
9
8
7
7
6
5
4
3
2
1
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Side Scan Sonar - Type
Rock and Coarse gravel
Gravel and Sand
Sand
Silt and Sand
Silt
N
W
E
S
0
0.25
0.5
1 Miles


Dundee Dam
0.0 to 0.5 ft
2378TCDD(ng/kg)
River Mile
ND plotted with open symbol
% Fines
0 to 10
10 to 20
20 to 40
40 to 60
60 to 100
No grain siz

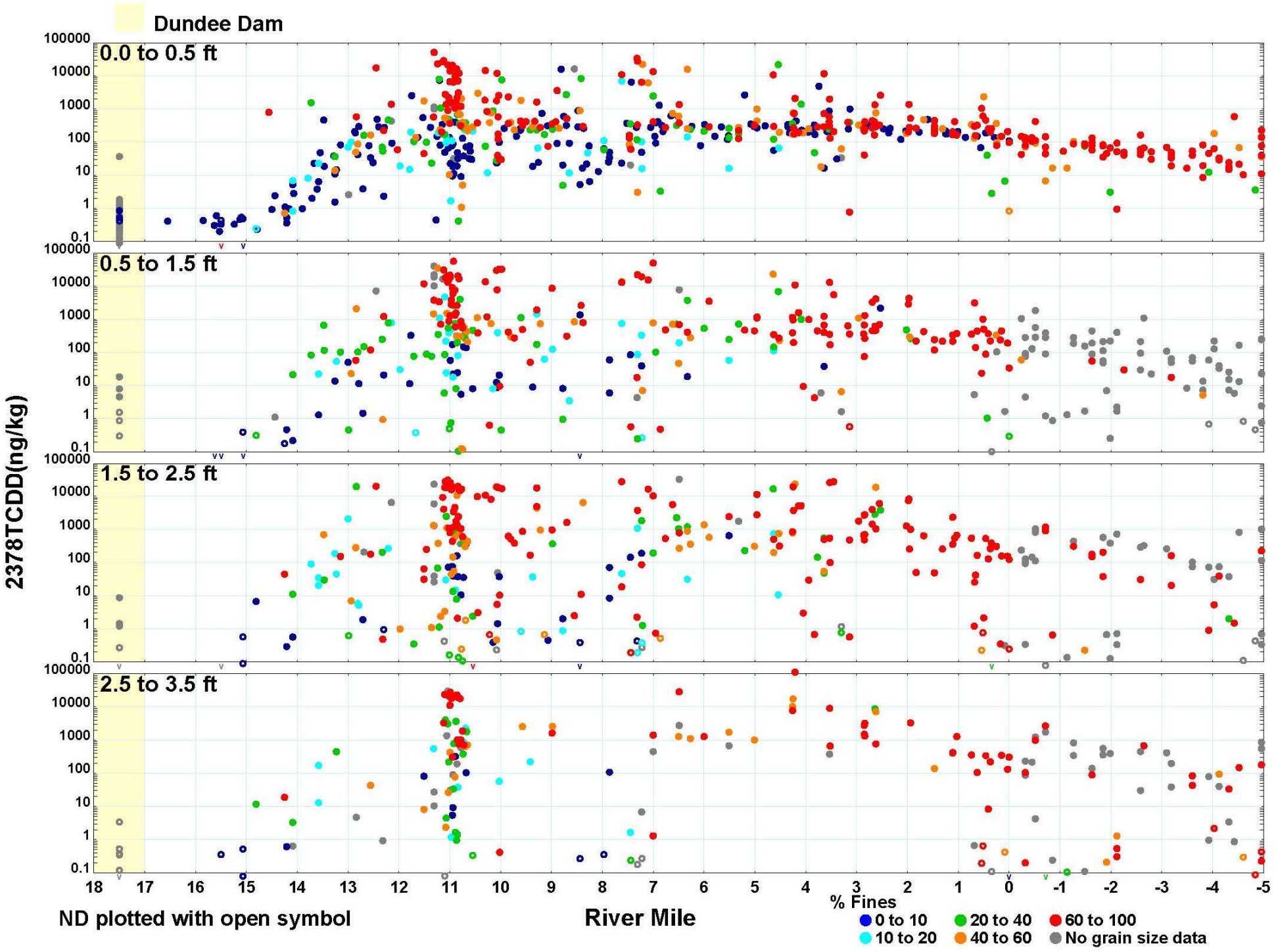

Dundee Dam
0.0 to 0.5 ft
DDx(mg/kg)
River Mile
Sum of o,p and p,p DDD, DDE & DDT (ND removed)
% Fines
0 to 10
20 to 40
60 to 100


Dundee Dam
0.0 to 0.5 ft
Total PCB(mg/kg)
River Mile
Sum of Homologs (ND removed)
% Fines
0 to 10
10 to 20
20 to 40
40 to 60
60 to 100
No grain size


Dundee Dam
0.0 to 0.5 ft
Mercury(mg/kg)
River Mile
ND plotted with open symbol
% Fines
0 to 10
20 to 40
60 to 100


Above Dundee Dam
Lower Passaic River
Newark Bay
HMW PAH (mg/kg)
River Mile
20
15
10
5
0
-5
Source: LPRSA Draft RI Report (Anchor QEA in preparation)

Overview of Subsurface Contaminant Trends

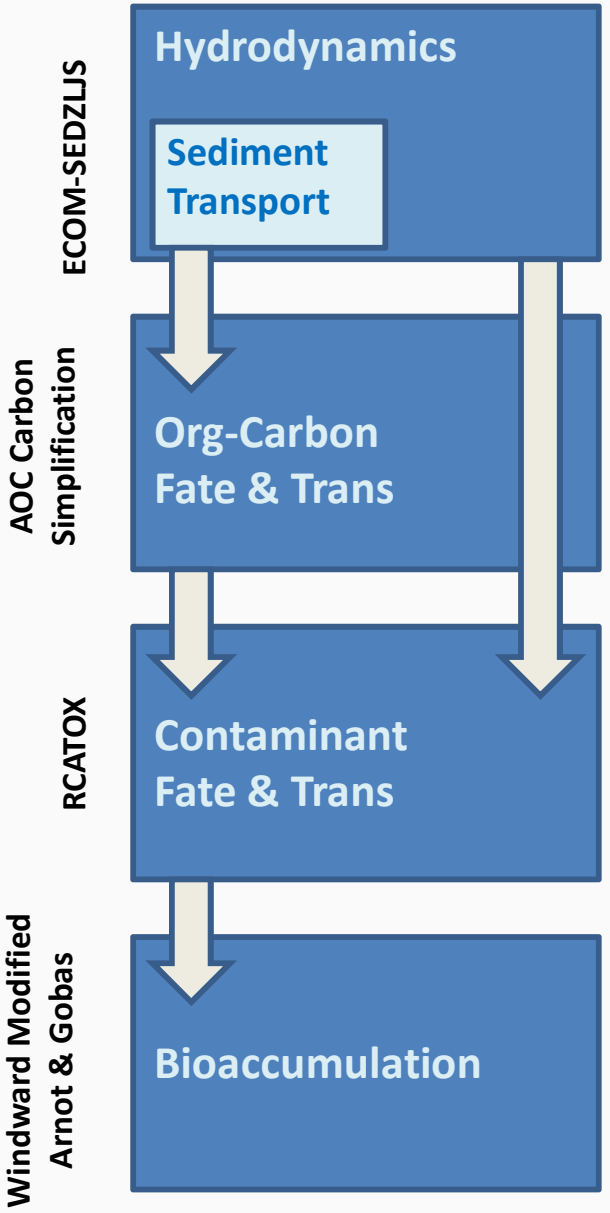

Dundee Dam
0.0 to 0.5 ft
0.5 to 1.5 ft
1.5 to 2.5 ft
2.5 to 3.5 ft
2378TCDD(ng/kg)
100000
10000
1000
100
10
1
0.1
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 -1 -2 -3 -4 -5
River Mile
ND plotted with open symbol
% Fines
0 to 10
10 to 20
20 to 40
40 to 60
60 to 100
No grain size data

Contaminant Concentration and Particle Size Trends

- Lower 8-mile surface sediments are primarily fines
- Upper 9-mile surface sediments are generally coarser than lower 8
  - Fines distributed in low energy areas and smaller, discontinuous pockets
- Most COPCs show some correlations with fines
  - TCDD shows strongest correlation
  - DDx, total PCB, and mercury correlations not as strong as TCDD
  - PAHs show elevated concentrations across range of grain sizes
- Most COPCs have decreasing concentrations above ~RM 13
  - Low flows needed for density-driven currents to get upstream of RM 13
  - Velocities are greater upstream of RM 13, resulting in erosion of fines and overall coarse substrate
- As part of the RD, additional sampling will be needed to inform any detailed remedy or interim action design
  - CPG has discussed potentially using a 80 ft triangular grid

Model Structure for 17-mile RI/FS

- EPA team developed models for Lower 8-mi Focused Feasibility Study and transferred to CPG for 17-mile RI/FS (hydrodynamic, sediment transport (HST), organic carbon (OC) fate and transport, contaminant fate and transport (CFT)
- CPG modifications:
  - Additional sediment size classes to ST model
  - Eliminated algal growth and death kinetics in OC model
  - Added reversible and resistant partitioning to CFT
  - Added fluff layer to CFT model
- CPG using bioaccumulation model (Arnot and Gobas approach) rather than empirical relationships (non-linear BSAFs).
- Current status: No further revision to HST and OC is anticipated. CFT currently confirming mass balances in revised code



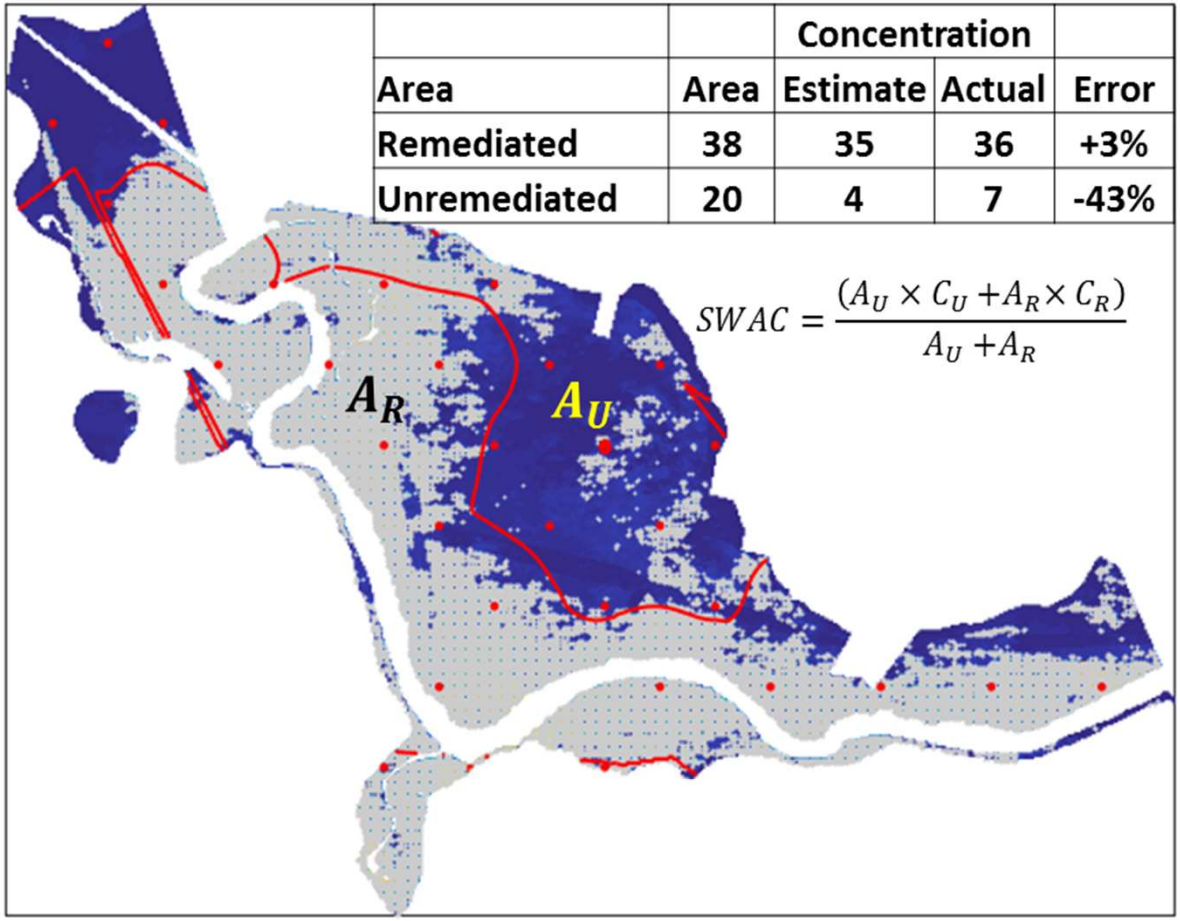
Overview of Contaminant Mapping

Contaminant Mapping – Overview of process

- CPG generates iterations of maps, EPA raises a number of issues
- EPA issues White Paper – June 2015
- CPG submits response – November 2015
- CPG requests meeting – January 2016
  - Implementing suggestions from EPA
  - Follow-up technical meetings – Feb & April 2016
- CPG generates revised maps using conditional simulation(CS) approach; EPA and CPG meet to review – May 2017
  - CPG proposes to use map CS-37 for COPC mapping
  - EPA suggest using extremes (high and low CS maps) to bound uncertainty
- CPG submits Revised RI rev 2 Appendix J for review – February 2018

Hill-topping Overview

		Concentration		
Area	Area	Estimate	Actual	Error
Remediated	38	35	36	+3%
Unremediated	20	4	7	-43%

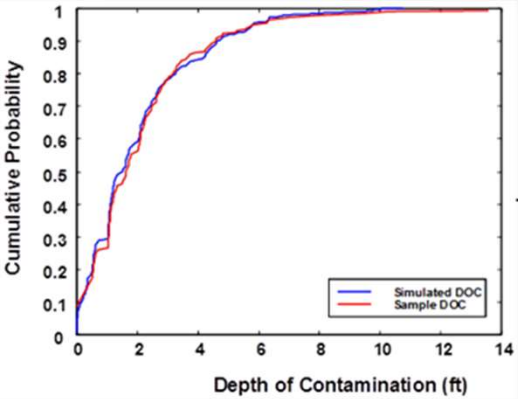


$$SWAC = \frac{(A_U \times C_U + A_R \times C_R)}{A_U + A_R}$$

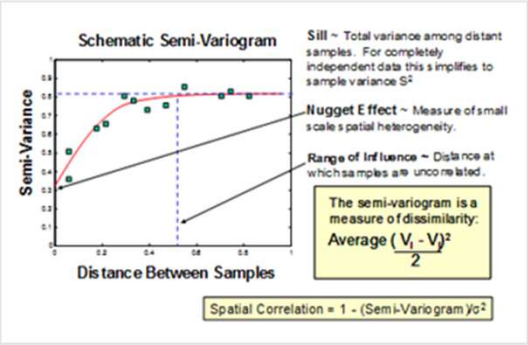
Some sediment is always misclassified and means estimated from the smooth surface are therefore biased estimators of remedial performance.

Conditional simulation provides an alternative estimation procedure that accounts for delineation uncertainty by averaging spatially variable concentrations

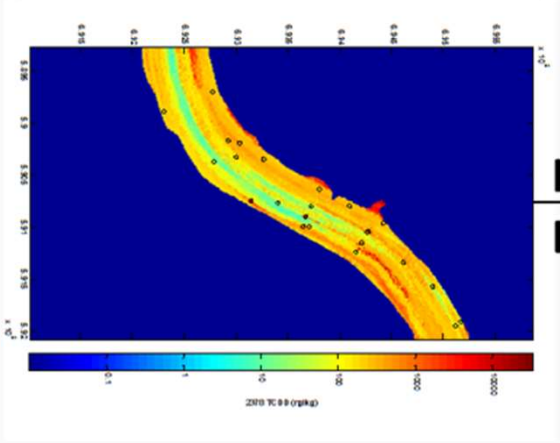
Conditional Simulation Method



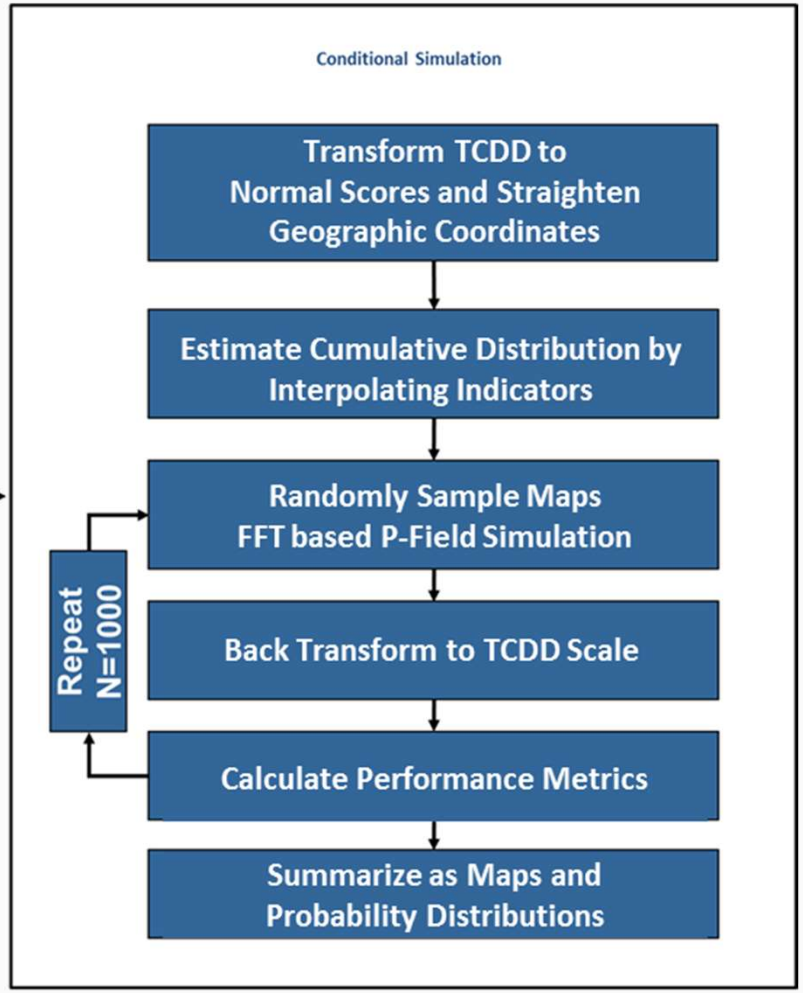
Statistical Distribution



Spatial Continuity

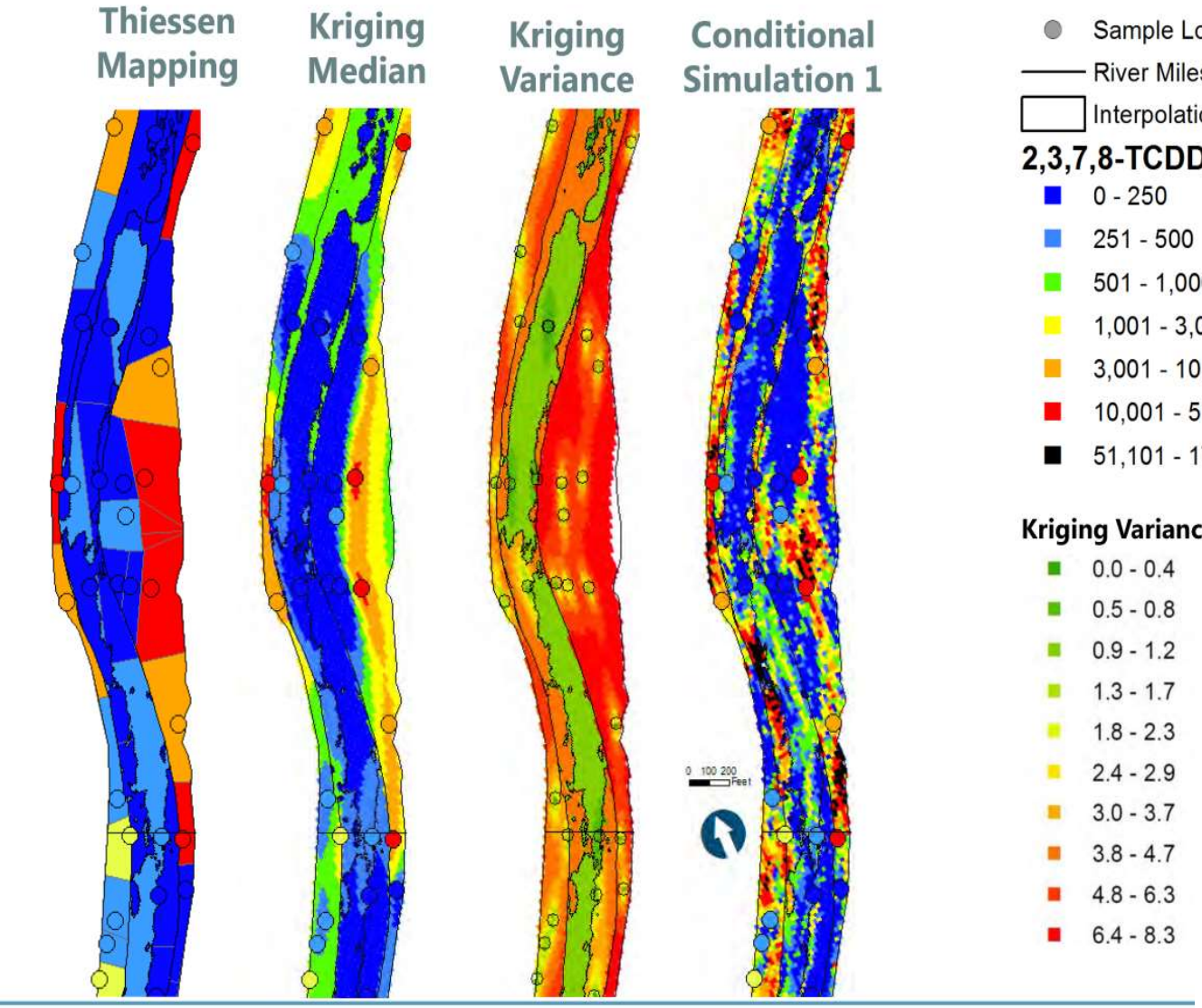


Interpolate Existing Data



Contaminant Mapping Iterations

Preliminary Results– Map RM 7.5



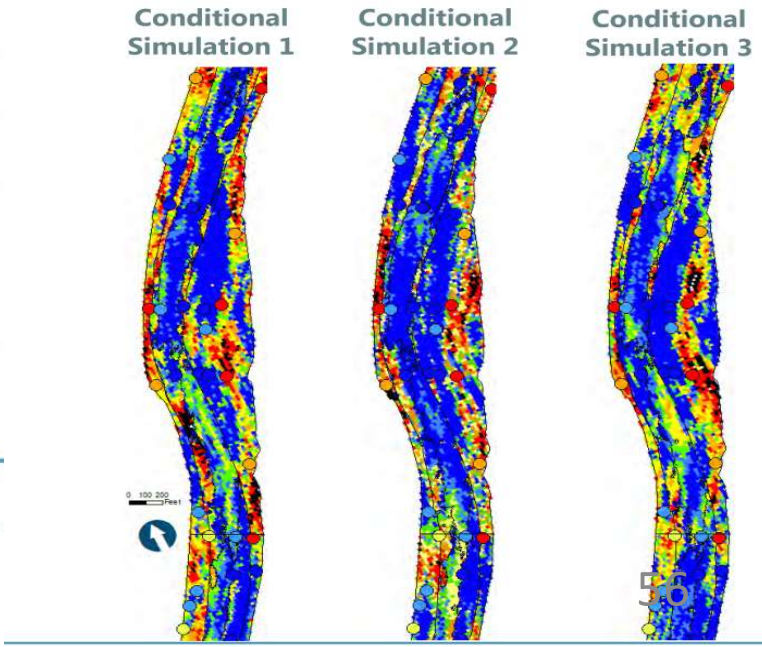
Sample Location
River Miles
Interpolation Boundaries

2,3,7,8-TCDD Conc. (ng/kg)

- 0 - 250
- 251 - 500
- 501 - 1,000
- 1,001 - 3,000
- 3,001 - 10,000
- 10,001 - 51,100
- 51,101 - 171,102

Kriging Variance (Natural Log)

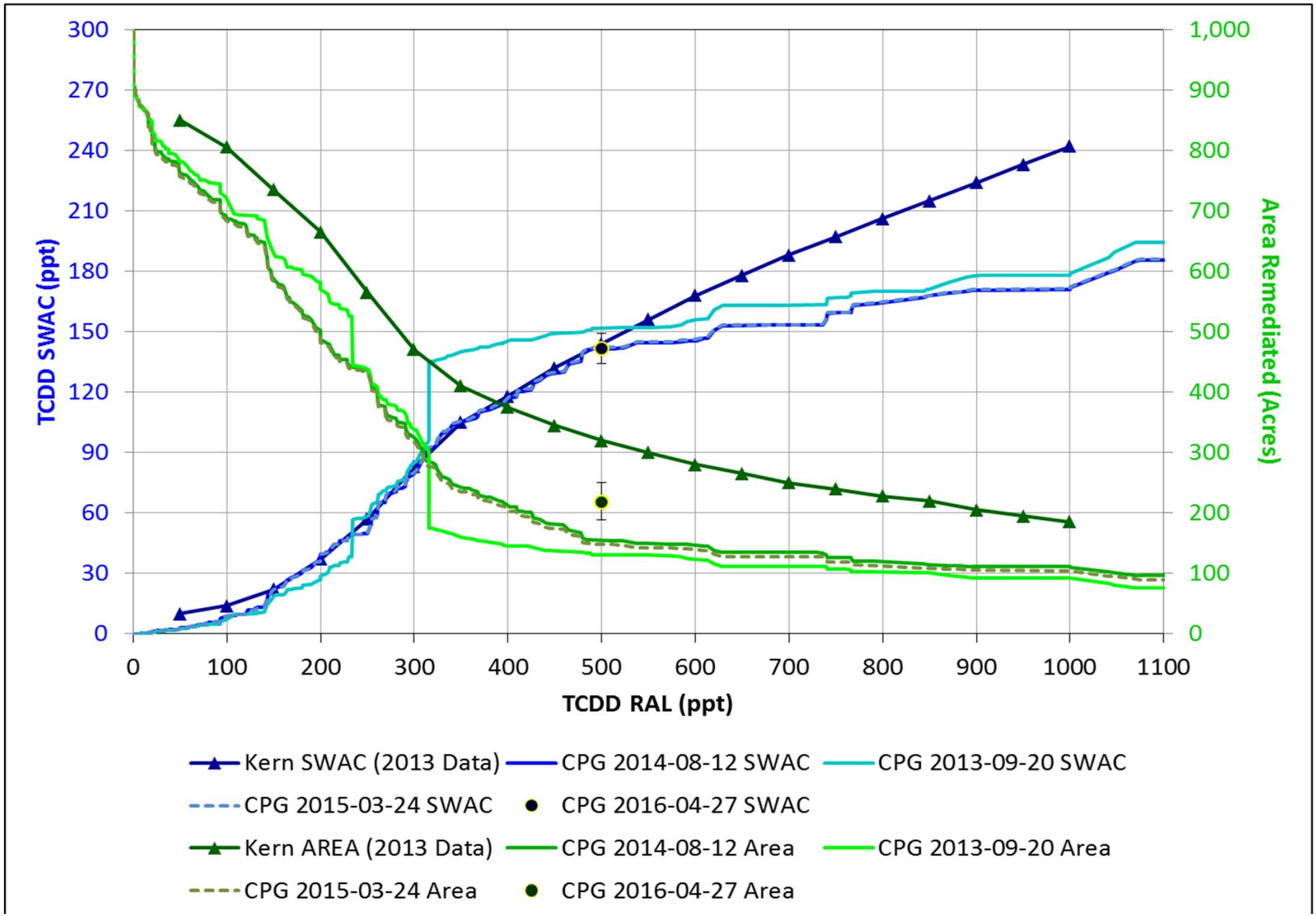
- 0.0 - 0.4
- 0.5 - 0.8
- 0.9 - 1.2
- 1.3 - 1.7
- 1.8 - 2.3
- 2.4 - 2.9
- 3.0 - 3.7
- 3.8 - 4.7
- 4.8 - 6.3
- 6.4 - 8.3



January 27, 2016 CPG & EPA Region 2 Meeting

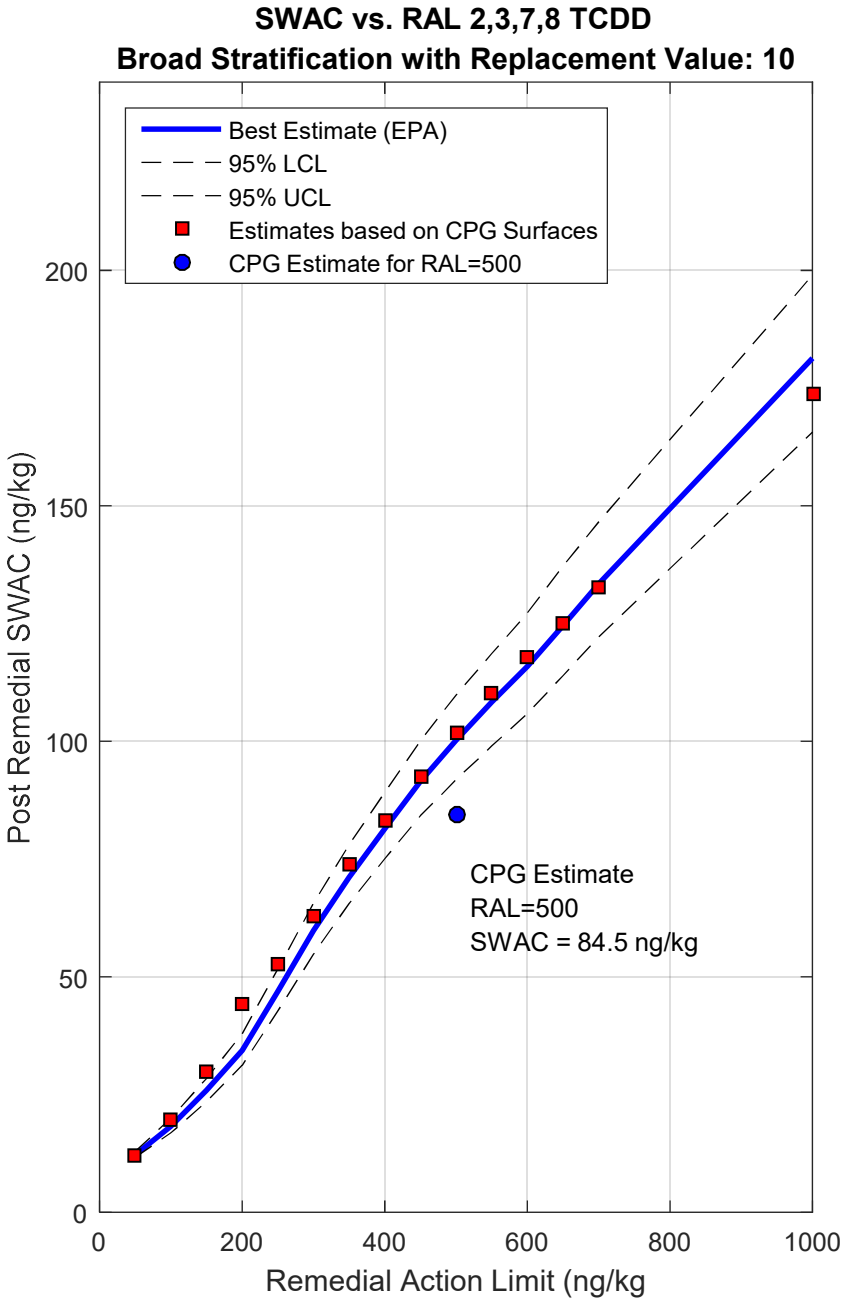
From "20160127 COPC Mapping Mtg - Final.pdf", Slides 44 and 45

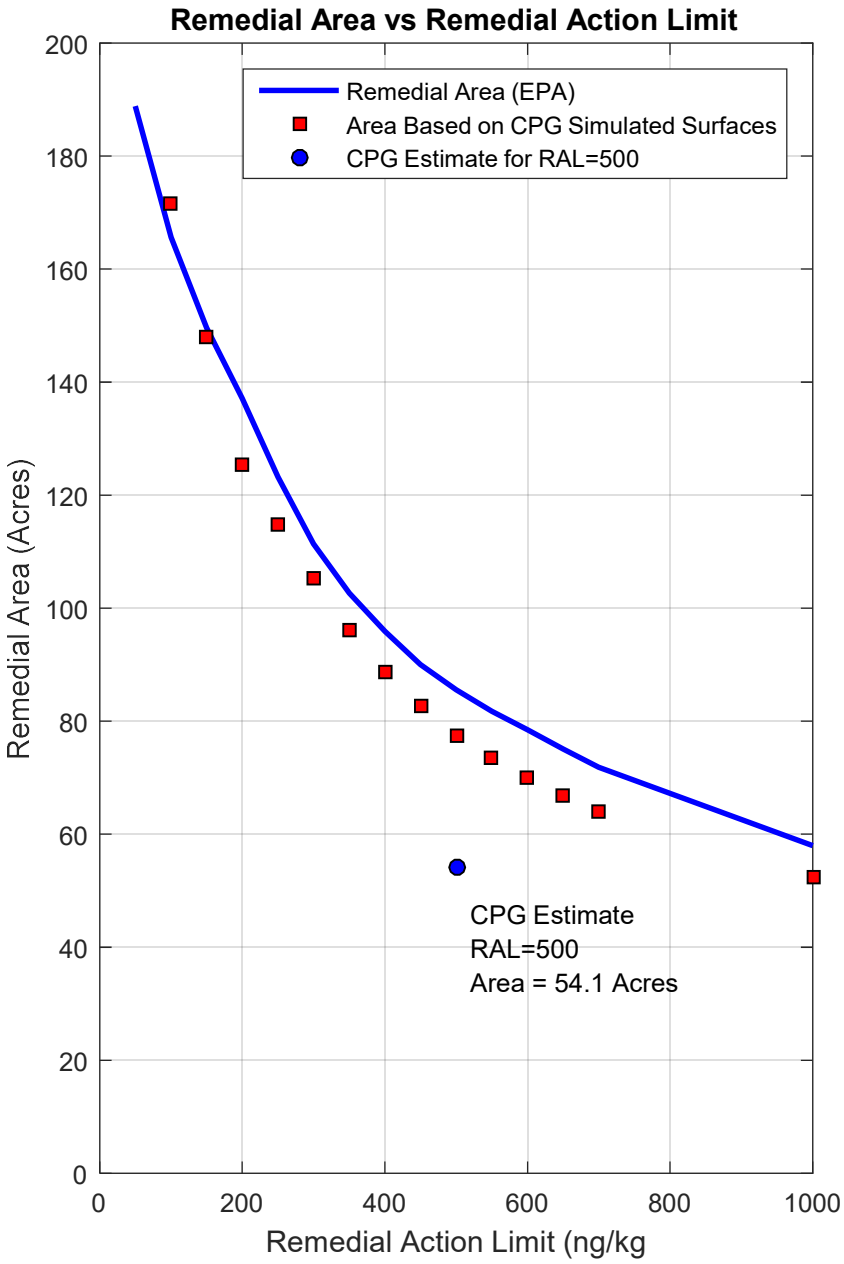
SWAC vs RAL for Contaminant Mapping Iterations



Kern lines developed by John Kern using a conditional simulation of the available 2005-2012 data (excludes SSP2)
CPG lines based on shape files provided by the CPG on the dates noted.
CPG points for 2016-04-27 = Average and range from "20160427 EPA-CPG COPC Mapping Mtg to R2.pdf" slide 36

Processing CPG Surfaces Using EPA RAL Footprint Yielded Similar Results





100 Conditional Simulation (CS) Maps – CS#37

Surface Weighted Average Concentration (SWAC)

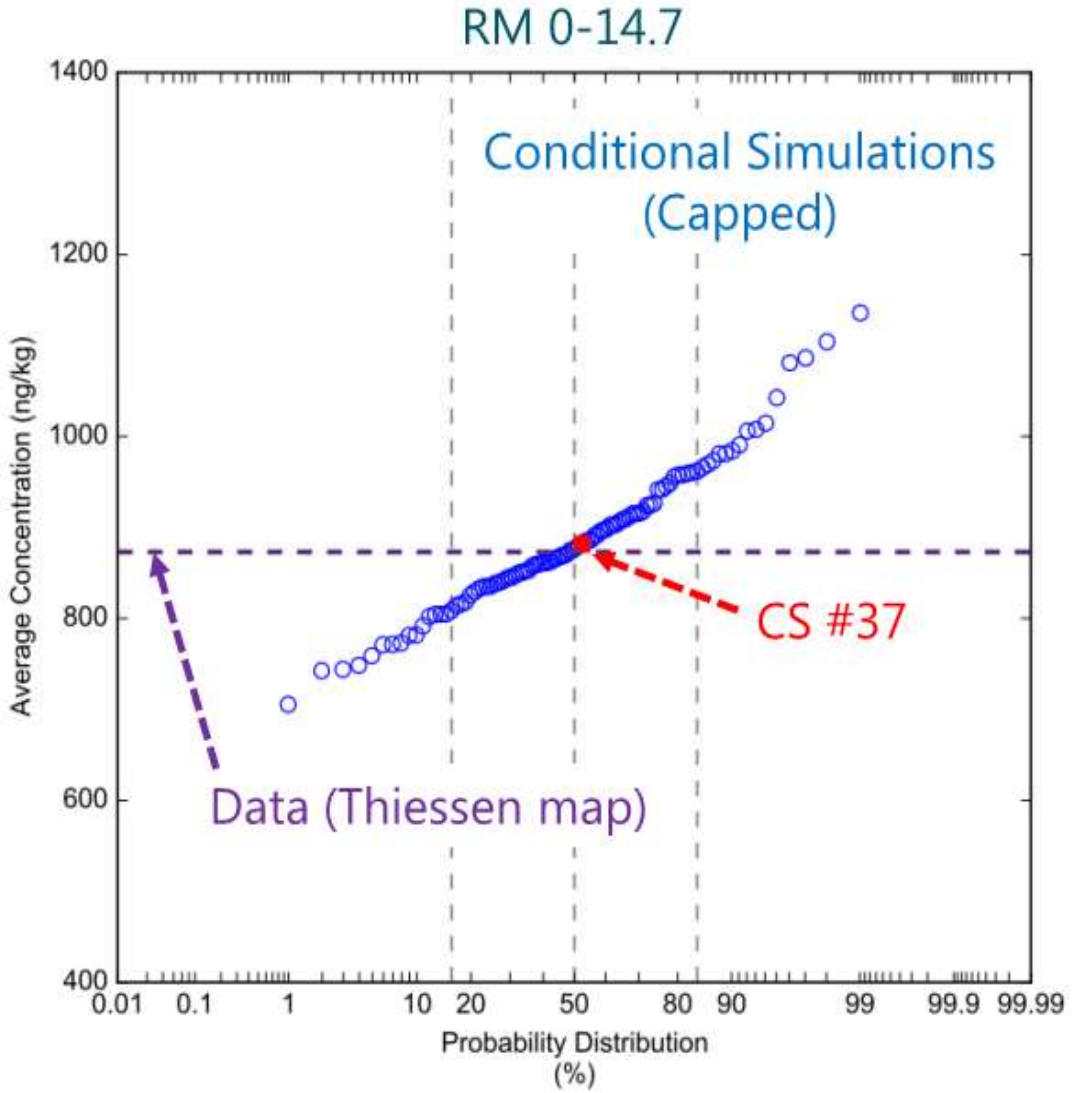
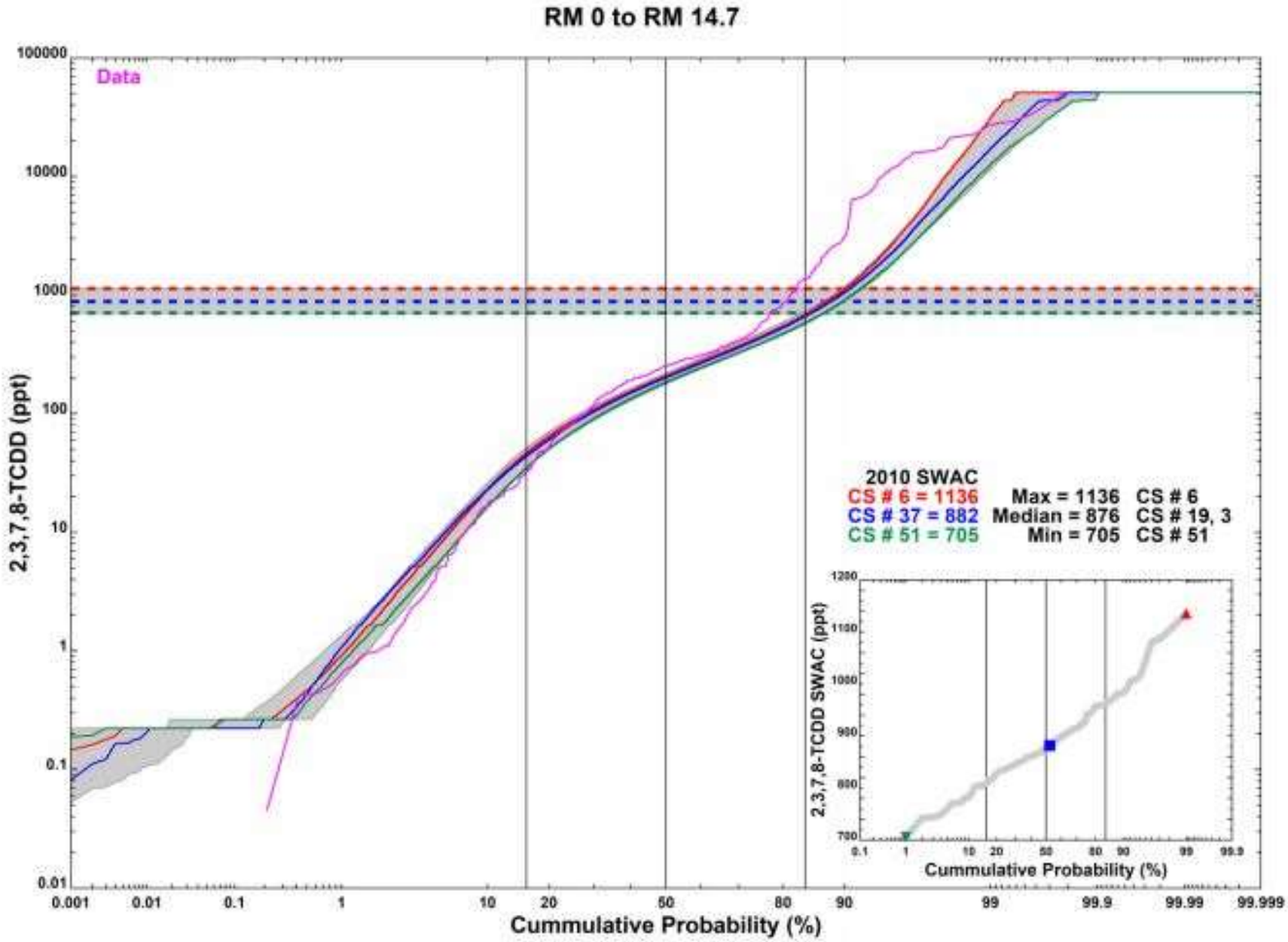
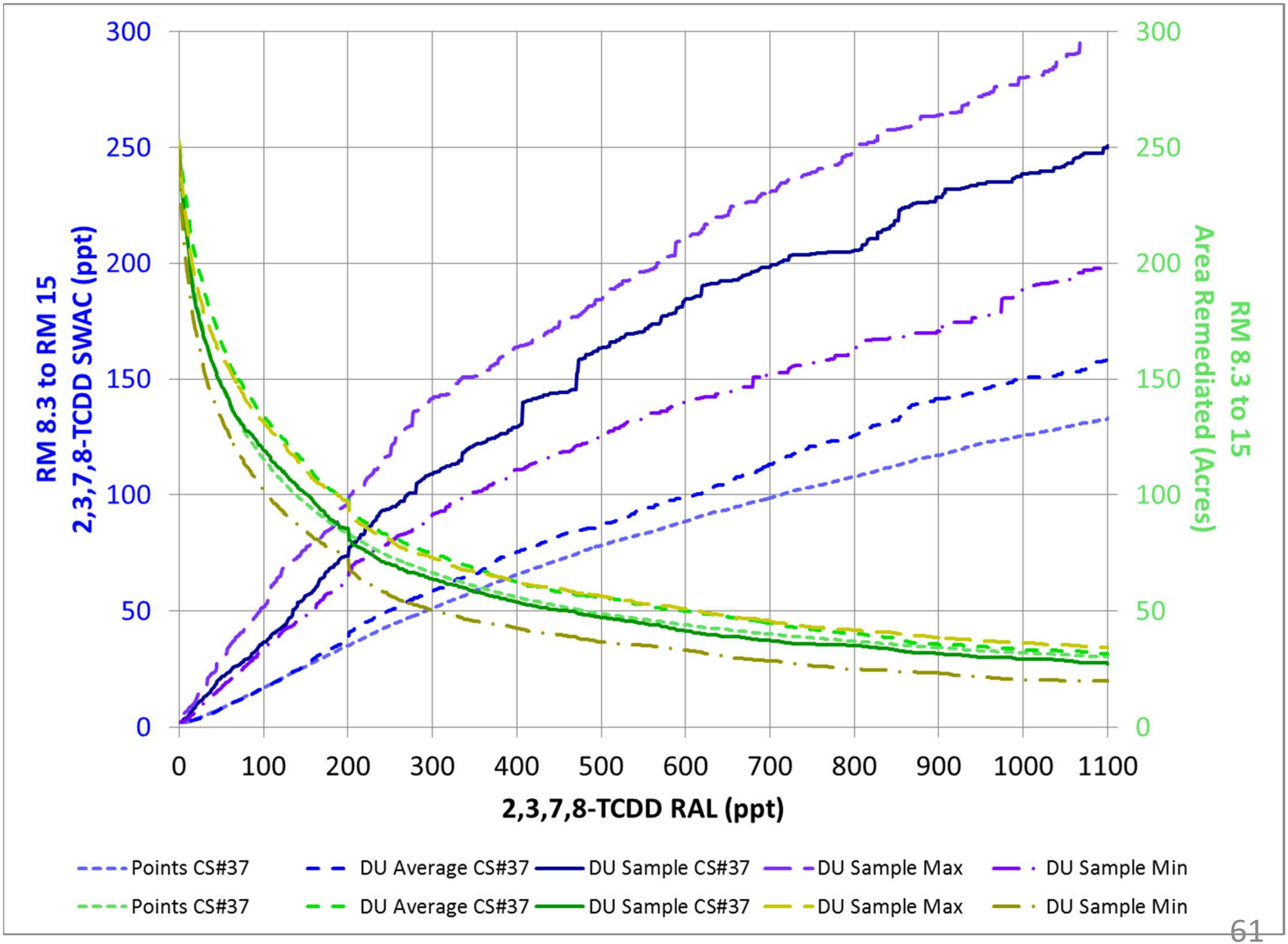
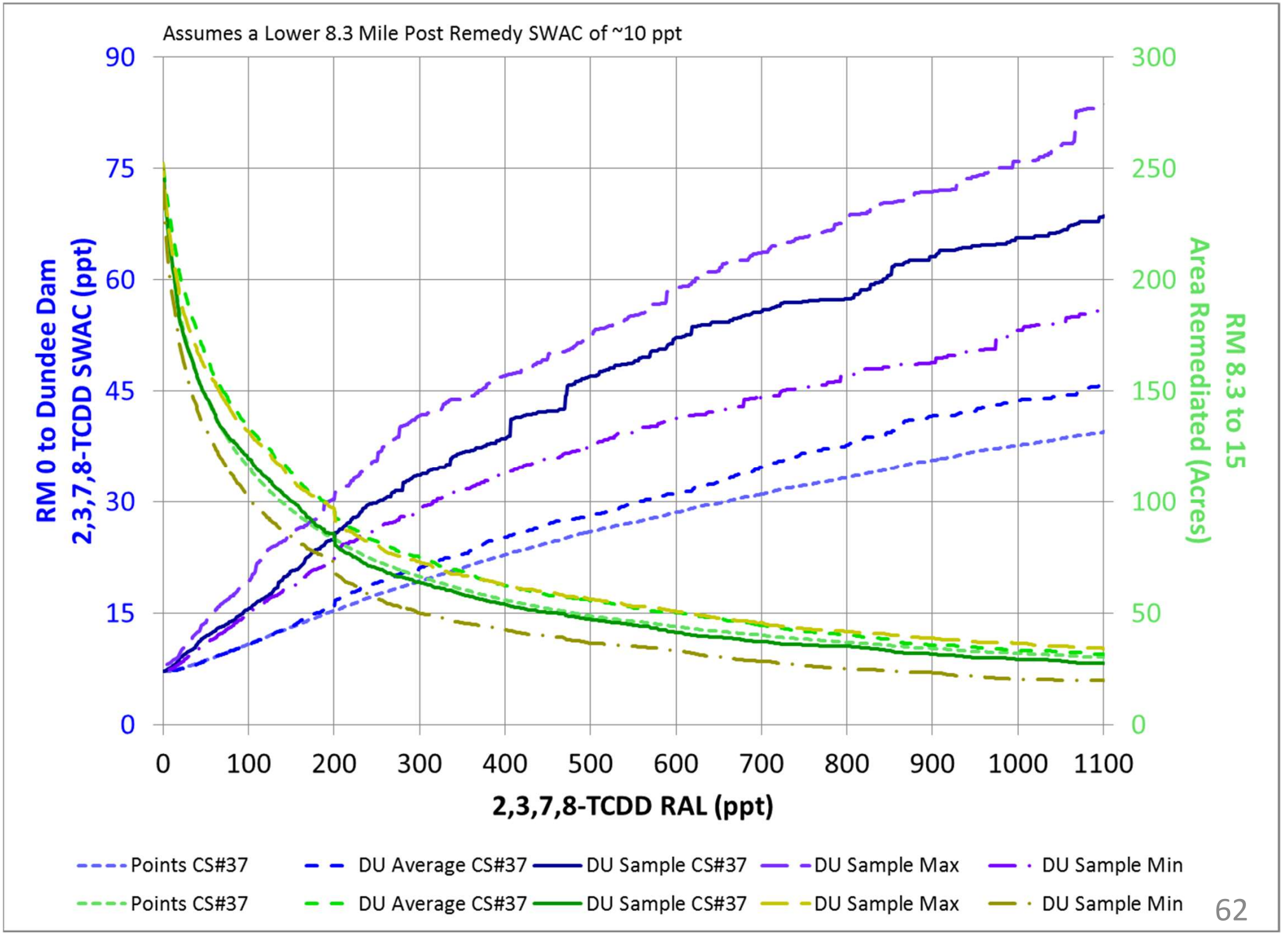


Figure 2. Concentration Distributions with the CPG's Proposed Surfaces




RM 8.3 to RM 15
2,3,7,8-TCDD SWAC (ppt)
Area Remediated (Acres)
RM 8.3 to 15
2,3,7,8-TCDD RAL (ppt)
0
50
100
150
200
250
300
0
100
200
300
400
500
600
700
800
900
1000
1100
Points CS#37
DU Average CS#37
DU Sample CS#37
DU Sample Max
DU Sample Min
Points CS#37
DU Average CS#37
DU Sample CS#37
DU Sample Max
DU Sample Min


Assumes a Lower 8.3 Mile Post Remedy SWAC of ~10 ppt
RM 0 to Dundee Dam
2,3,7,8-TCDD SWAC (ppt)
RM 8.3 to 15
Area Remediated (Acres)
0
15
30
45
60
75
90
0
50
100
150
200
250
300
0
100
200
300
400
500
600
700
800
900
1000
1100
2,3,7,8-TCDD RAL (ppt)
Points CS#37
DU Average CS#37
DU Sample CS#37
DU Sample Max
DU Sample Min
Points CS#37
DU Average CS#37
DU Sample CS#37
DU Sample Max
DU Sample Min

Contaminant Mapping Summary

- Conclusions may be sensitive to mapping method selection
  - CFT Model initial conditions relatively insensitive to method selection
  - SWAC vs RAL relationship based on deterministic interpolation is biased
    - Remedial areas are understated
    - Post remedial SWAC is understated
- Conditional simulation provides method to incorporate mapping uncertainty into remedial decisions
- Uncertainty in SWAC forecast decreases with
  - Decreasing RAL
  - Increasing remedial footprint
- Cost benefits of design sampling can be fully evaluated
- Performance of remedial design options can be evaluated independent of “chasing concentrations”

Feasibility Study

Lower Passaic River Study Area Feasibility Study Overview:

- CPG's proposal of a source control interim action for the upper 9 miles
- Remedial Action Objectives (RAO's) currently under consideration for interim action
- FS alternatives under consideration

Basis for Evaluating Interim Actions

EPA's 2005 Sediment Guidance:

- Take other early or interim actions, followed by monitoring before deciding on a final remedy
- Use adaptive management at complex sediment sites…test hypotheses, reevaluate assumptions as new information is gathered
- Phase in remedy selection where fate and transport is not well understood or there are significant implementation issues
- Consider separating management of source area from other areas

CPG's Proposal of an Interim Action in the Upper-9 Miles

- **Foundation**
  - Areas with elevated contaminants drive risk and inhibit recovery
- **Action**
  - Actively remediate sediments that are potential source areas (above a Remedial Action Level [RAL]) and inhibiting recovery
- **Intended Response**
  - Allow areas with net deposition (good recovery potential) to respond to the substantial reduction in concentrations achieved by remediating source areas
  - Allow areas subject to cyclical erosion and deposition to respond to the substantial reduction, although more slowly
  - Achieve reduction in average concentrations and reduce risk

Overview of CPG's Approach to Proposed Interim Action

- **Interim Action (ROD1)**
  - Remove source material in the upper nine miles
    - Goals immediately after action
      - 2,3,7,8 TCDD – achieve 90% SWAC reduction
      - Total PCB - achieve SWAC below background
        - lower 8 FFS: 0.46 mg/kg
  - Conduct Performance Monitoring
    - Evaluate recovery
    - Assess acceptable risk levels are being achieved
- **Subsequent (Second Interim or Final) Action (ROD2)**
  - Monitoring consistent with projections
    - Establish cleanup goals
  - Monitoring not consistent with projections
    - Develop and implement additional remediation

Item for CSTAG discussion:
Does an interim remedy make sense for the upper-9 miles?

CPG's Proposed Interim Action - The details

- **Dredge/cap source material in upper nine miles**
  - Proposed Remedial Action Levels (RALs)
    - 2,3,7,8- TCDD: 300 ppt (ng/kg)
    - Total PCBs: 1 ppm (mg/kg)
  - Source material footprint
    - Approximately 80 acres
    - RM 8.3 to 14.7
- **Adjust RALs in Remedial Design**
    - Pre-Design Investigation data
    - Model projections refinement
    - RAL and footprint reassessment
- **Implement Interim Action**
- **Conduct performance monitoring; compare to model projections**

Item for CSTAG discussion:
- Consideration of the Cooperating Parties Group (CPG) proposed interim action

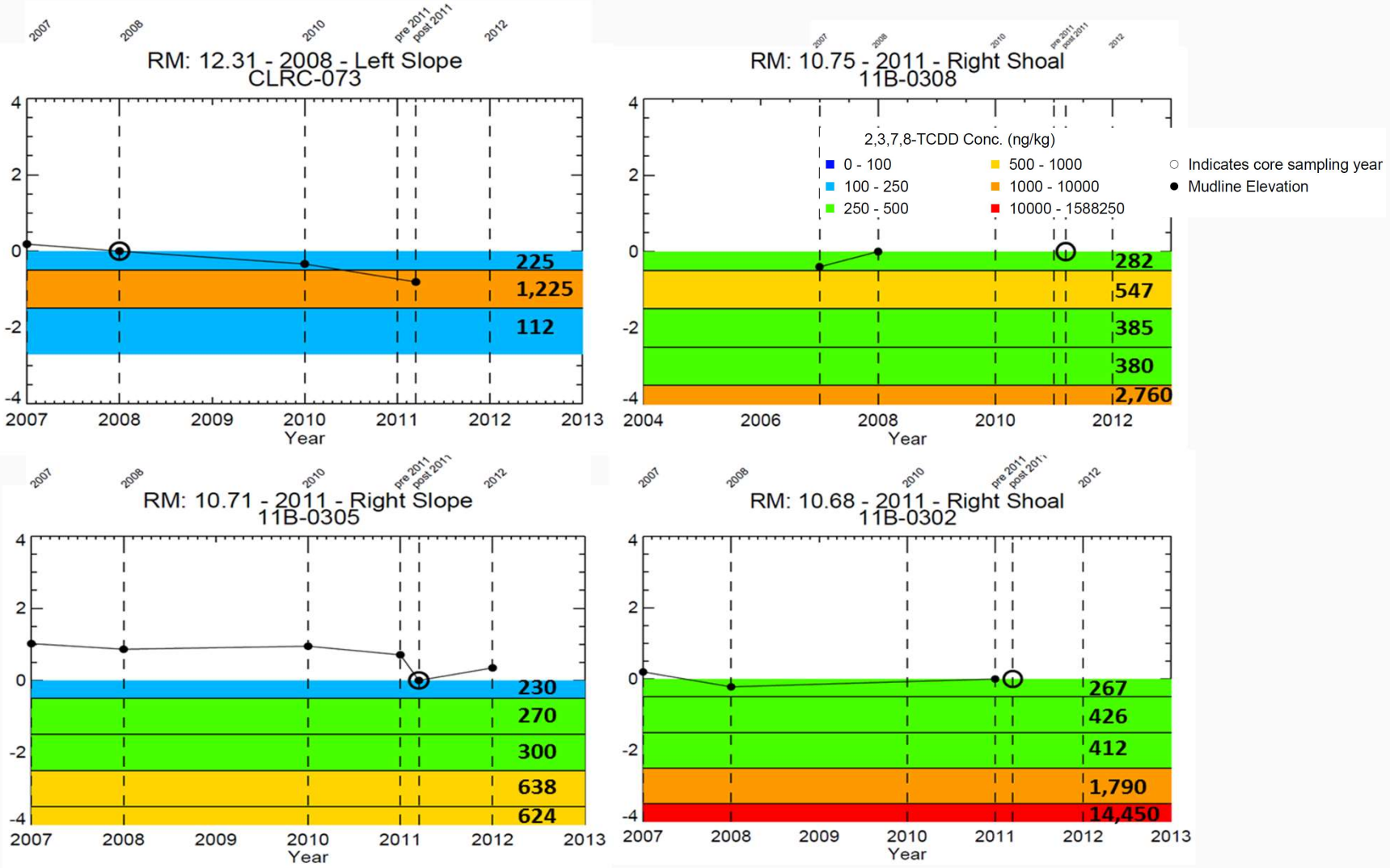
CPG's Justification for Proposed RALs

CPG's Proposed RALs:
2,3,7,8-TCDD: 300 ppt
Total PCB: 1 ppm

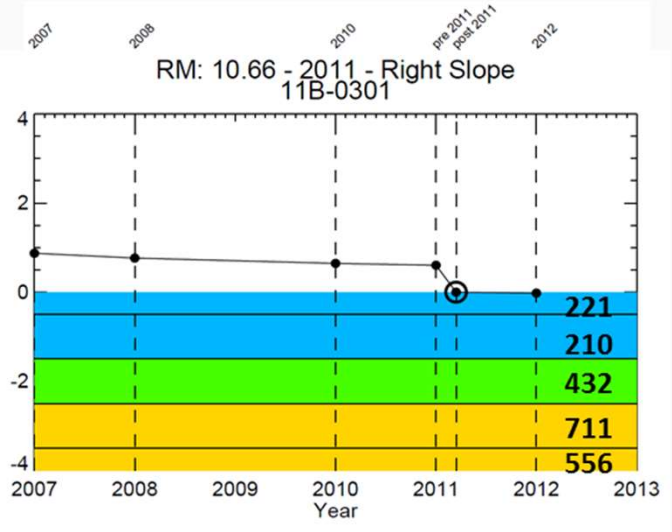
- **Concentration on depositing solids**
  - In beryllium-bearing sediment (measured by EPA team)
    - 200 – 400 ppt for 2,3,7,8-TCDD
  - In sediment accumulated on RM 10.9 cap (measured by EPA team)
    - Range: 150 – 680 ppt, average 315 ppt for 2,3,7,8-TCDD
    - Ranged: 0.4 – 0.9 ppm, average 0.8 ppm for total PCB
- **Water column particulate concentrations (solids normalized) -** measured during High Volume Chemical Water event
    - Range: 180 – 590 ppt, average 323 ppt for 2,3,7,8-TCDD
    - Range: 0.4 – 1.3 ppm, average 0.8 ppm for total PCB
- **Cores with 200-400 ppt 2,3,7,8-TCDD: examine for link to deposition**

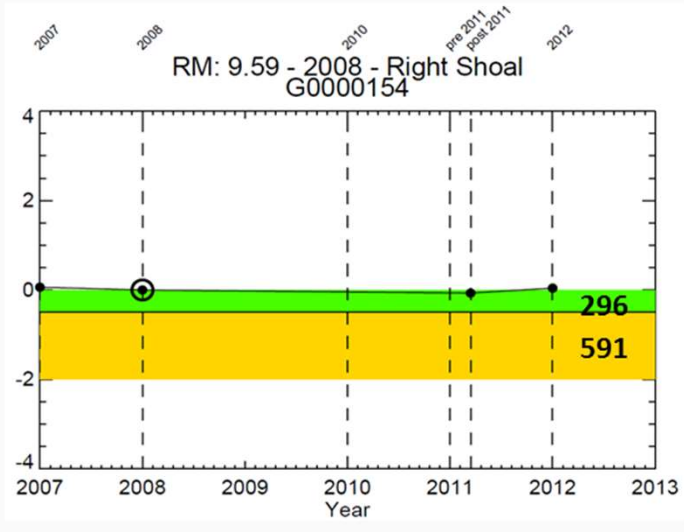
Locations of cores with 200-400 ppt 2,3,7,8-TCDD in surface layer

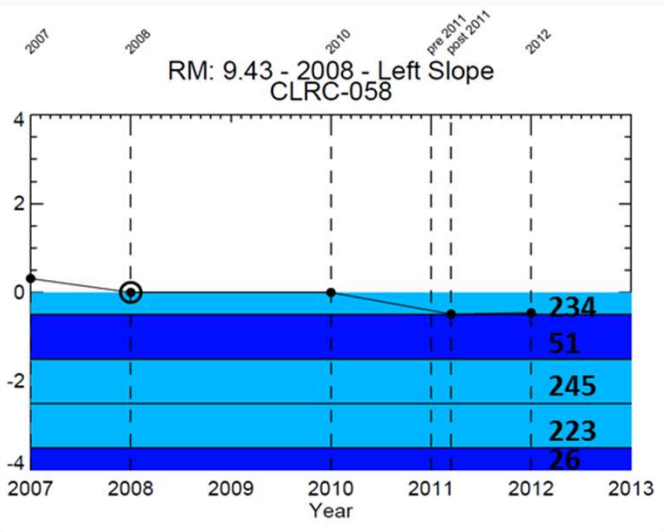
Examining Cores for Link to Deposition



Examining Cores for Link to Deposition



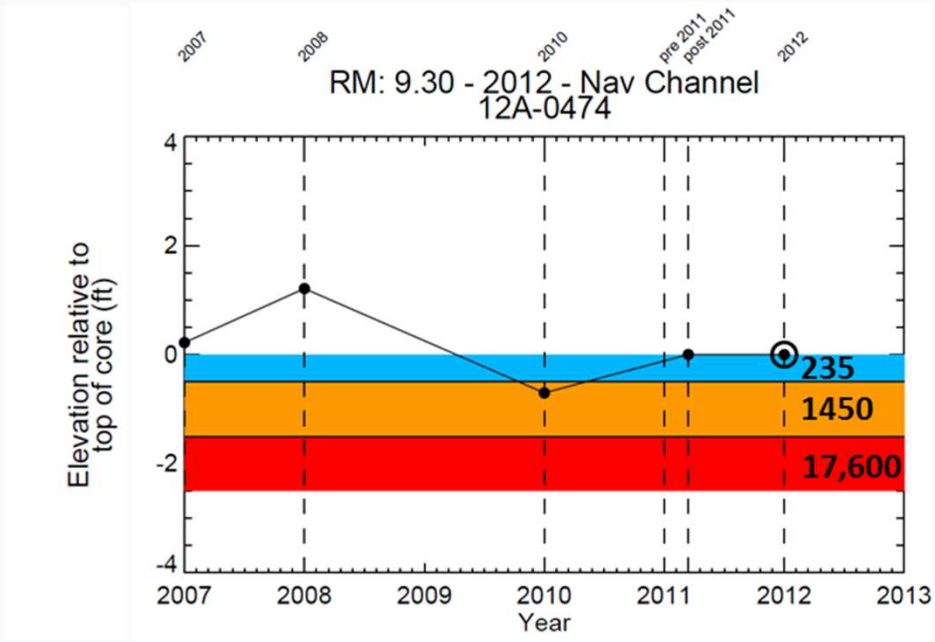


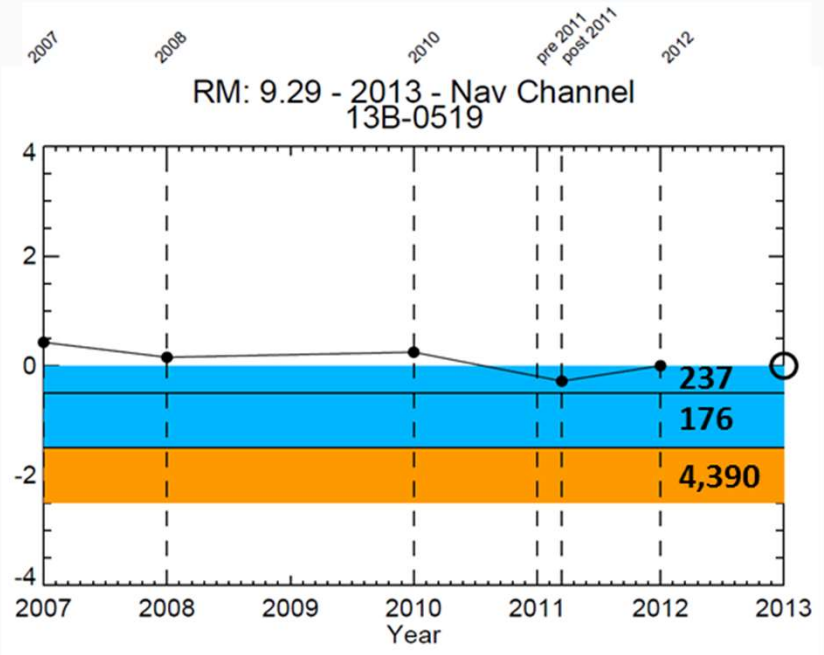


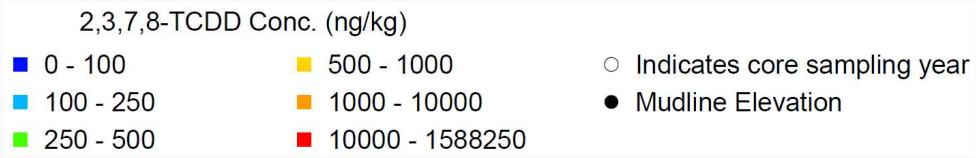
2,3,7,8-TCDD Conc. (ng/kg)

- 0 - 100
- 100 - 250
- 250 - 500
- 500 - 1000
- 1000 - 10000
- 10000 - 1588250
- ○ Indicates core sampling year
- ● Mudline Elevation

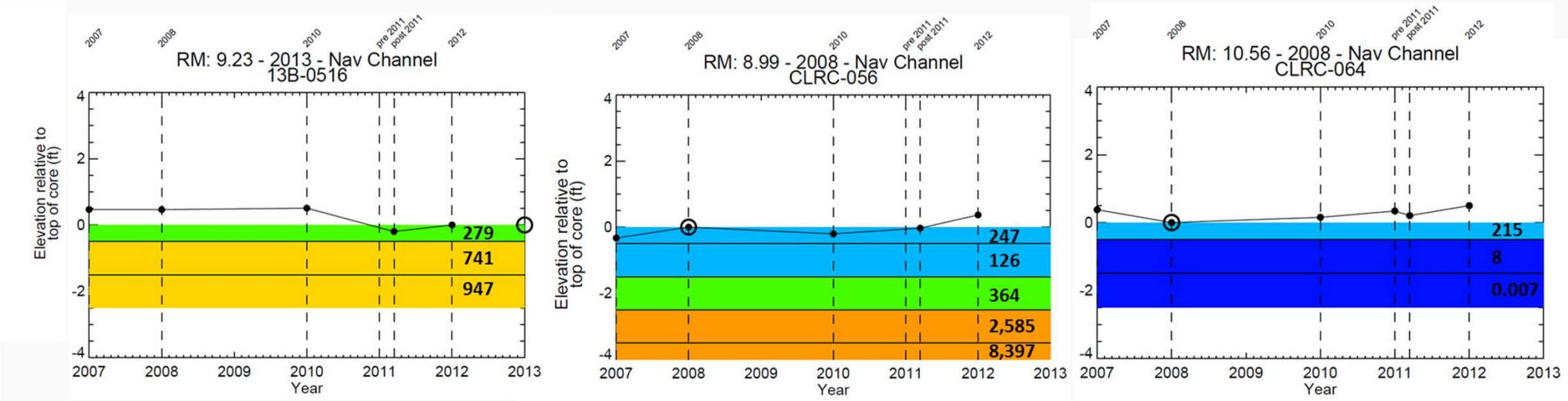
Examining Cores for Link to Deposition







Examining Cores for Link to Deposition



2,3,7,8-TCDD Conc. (ng/kg)

- 0 - 100
- 100 - 250
- 250 - 500
- 500 - 1000
- 1000 - 10000
- 10000 - 1588250
- ○ Indicates core sampling year
- ● Mudline Elevation

Evaluation of CPG's Proposed RALs and Additional RALs

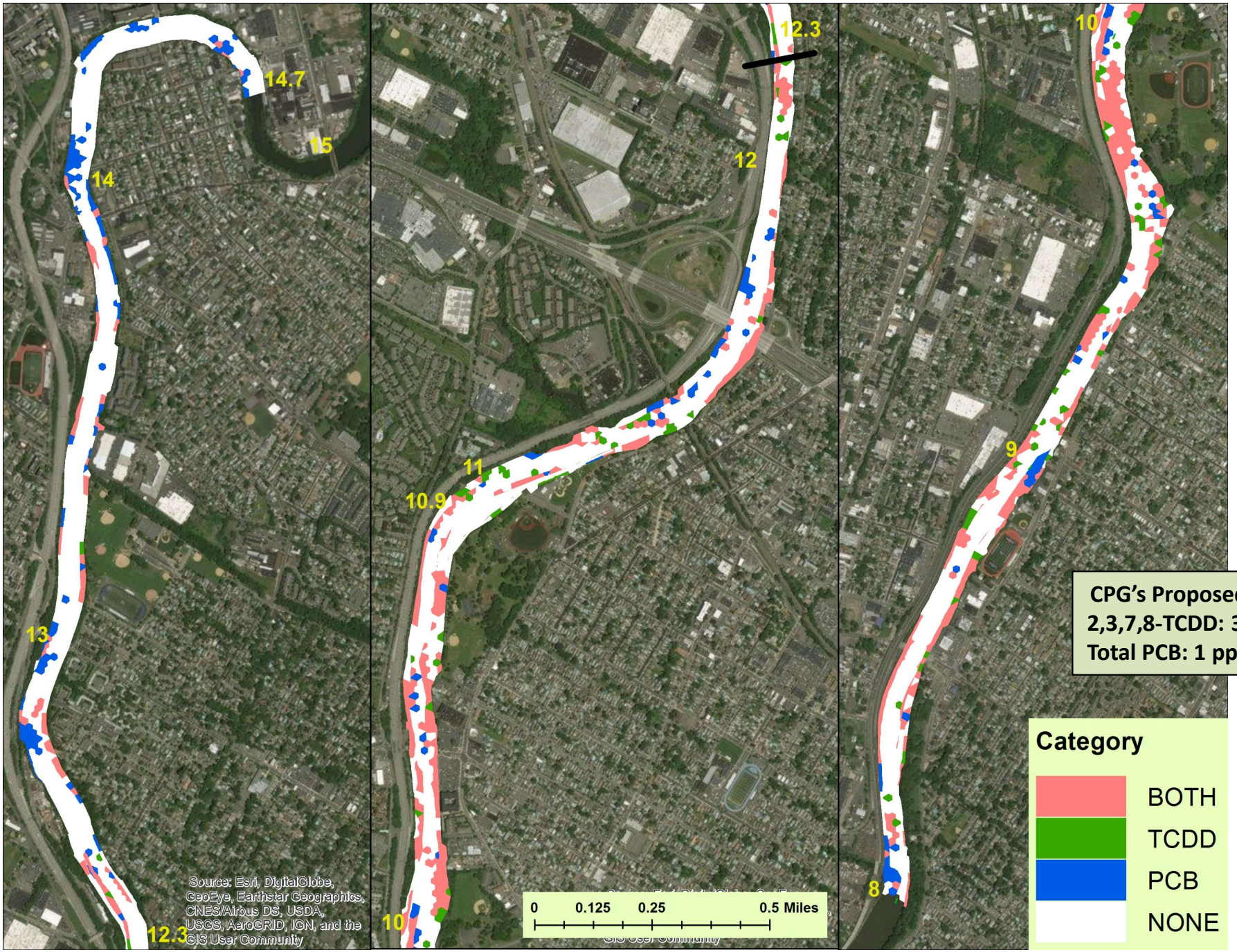
Remedial Action Levels (RALs)			Removal Area (Acres)	RM 8-14.7		RM 8- 17.4		RM 0 - 17.4	
River-wide	Less than 1 cm/yr Deposition	No Multibeam Bathy Data		SWAC (ppt)	Percent Reduction	SWAC (ppt)	Percent Reduction	SWAC[1] (ppt)	Percent Reduction
No Action			0	994	0	728	0	252	0
400	400	400	79	98	90%	72	90%	31	88%
400	300	200	90	75	93%	55	92%	25	90%
350	350	350	81	95	90%	70	90%	30	88%
350	250	300	83	89	91%	65	91%	29	89%
350	200	300	84	88	91%	64	91%	28	89%
300	**300**	**300**	**83**	**88**	**91%**	**65**	**91%**	**29**	**89%**
300	300	250	84	81	92%	59	92%	27	89%
300	300	200	91	72	93%	53	93%	25	90%
300	250	300	84	87	91%	64	91%	28	89%
300	200	300	85	86	91%	63	91%	28	89%
250	250	250	86	78	92%	57	92%	26	90%
200	200	200	97	65	94%	47	93%	23	91%
100	100	100	124	33	97%	24	97%	15	94%

Note 1: assumes SWAC = 10ppt in RM 0-8

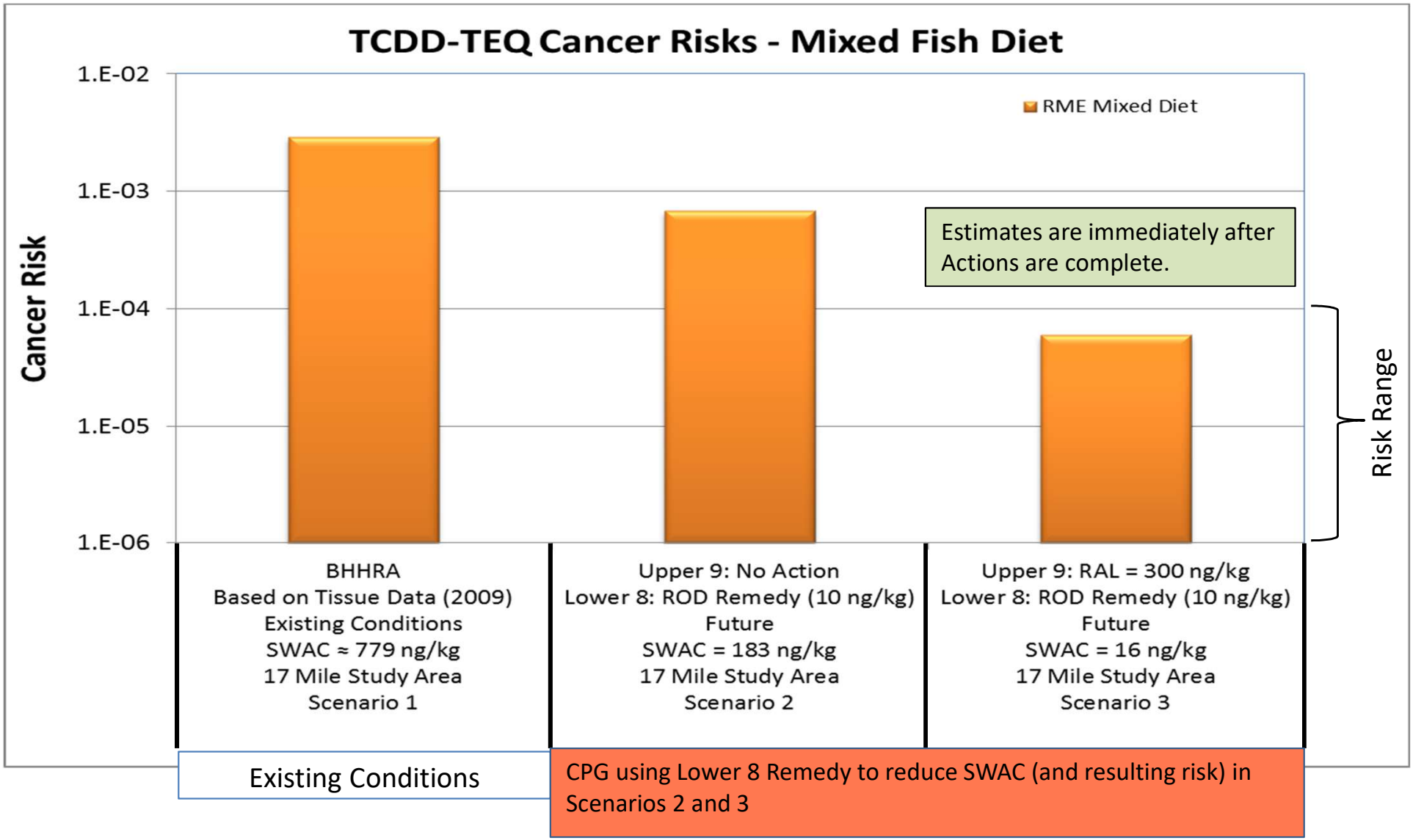
Estimates are immediately after Actions are complete. Map 37 used in evaluation. All scenarios include 1 ppm Total PCB RAL.

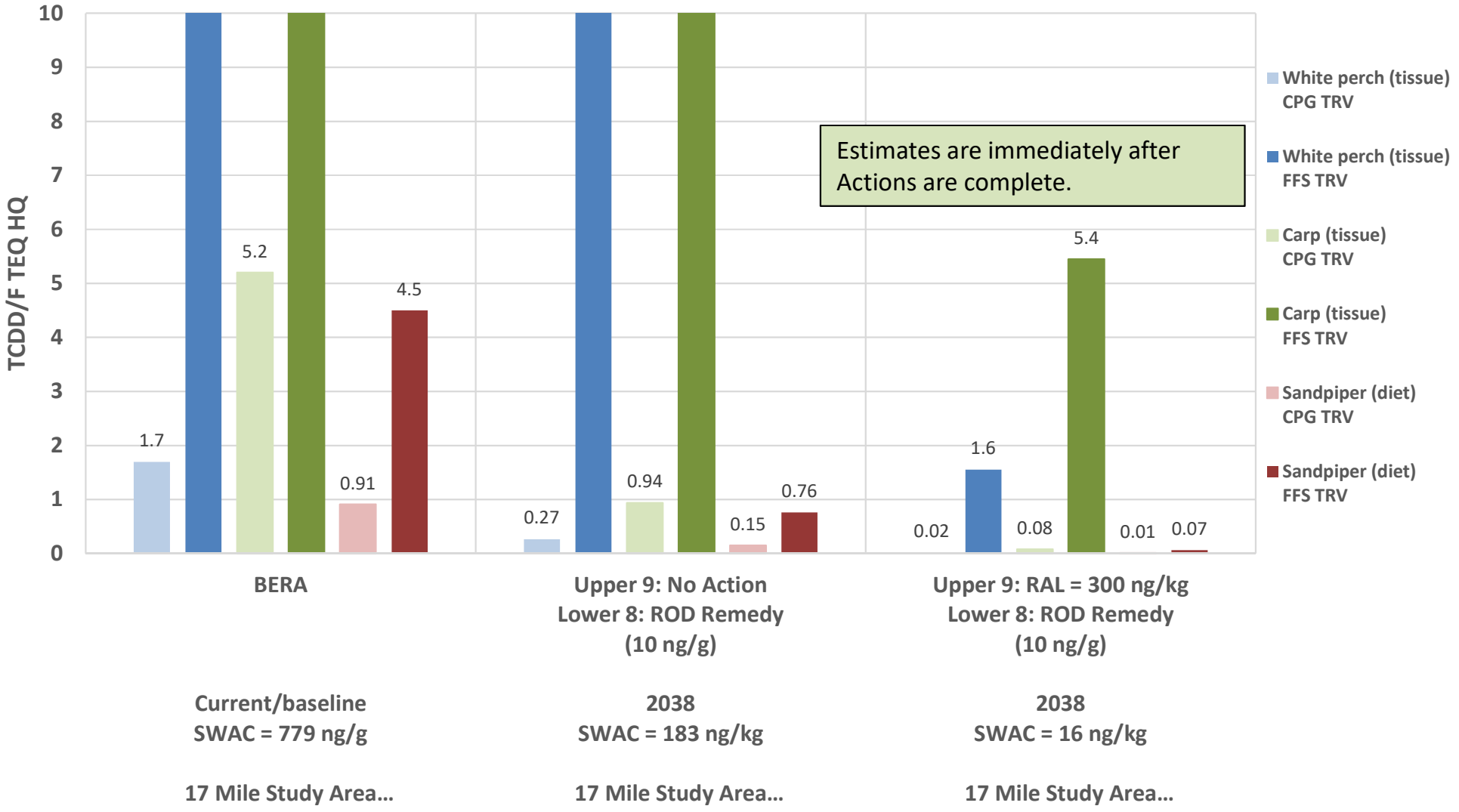
Item for CSTAG Discussion: The CPG proposed RALs, and EPA has demonstrated the effect of alternate RALs. The importance of evaluating alternate RALs in the FS (and Design) should be considered.

Interim Action Areas Based on Map 37 and CPG's Proposed RALs



CPG Human Health Risk Estimates – Proposed RALs Adult and Child Angler (Under revision)





CPG using Lower 8 Remedy to reduce SWAC (and resulting risk) in Scenarios 2 and 3

Note: EPA allowed presentation of different TRVs in the draft BERA from those used for the lower 8.3 which results in lower CPG HQs as shown. The HQs shown may be considered upper and lower limits. EPA plans to re-evaluate TRVs in the FS when PRGs are estimated.

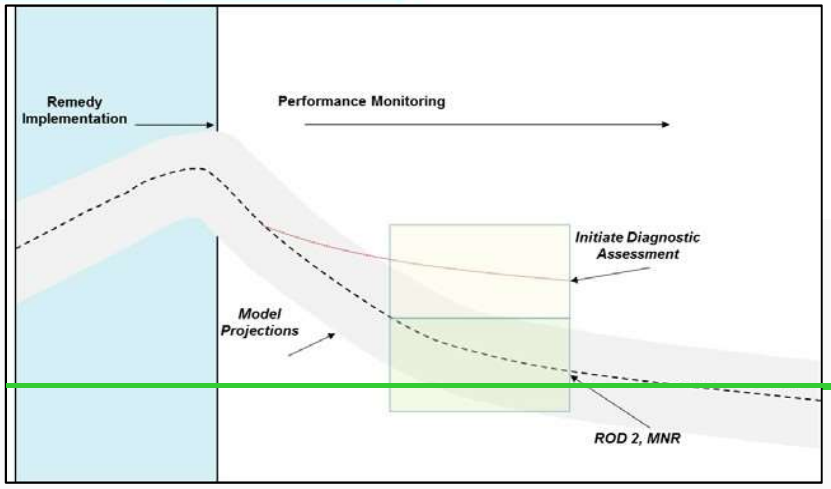
CPG's Proposed Upper 9 Mile Iterative Management Process

Remedial Design
- Perform baseline monitoring
- Investigate uncertainties
- Develop recovery projections using refined models
- Set triggers

→ **Remedy Implementation** → **Long-term Performance Monitoring** → **Recovery progressing within expected range?**

Yes →
- MNR final remedy
- Final cleanup goals
- Final ROD

No →
- Diagnostic assessment
- Additional monitoring to reduce uncertainty
- Evaluate/ implement additional actions
- Second interim ROD



Human Health Risk Goal: 10^{-4}

CPG's Proposed Predesign Investigation (PDI) and Monitoring

		Bathymetry	Water Column	Biota	Sediment (Recovery Indicator Areas)
PDI/Baseline		√	√	√	√**
Remedy Implementation			√	√	
Year 0 Post Construction		√	√	√	√
Long-term	Primary*	√	√	√	
	Diagnostic		√	√	√

* Primary components are those identified as triggering metrics

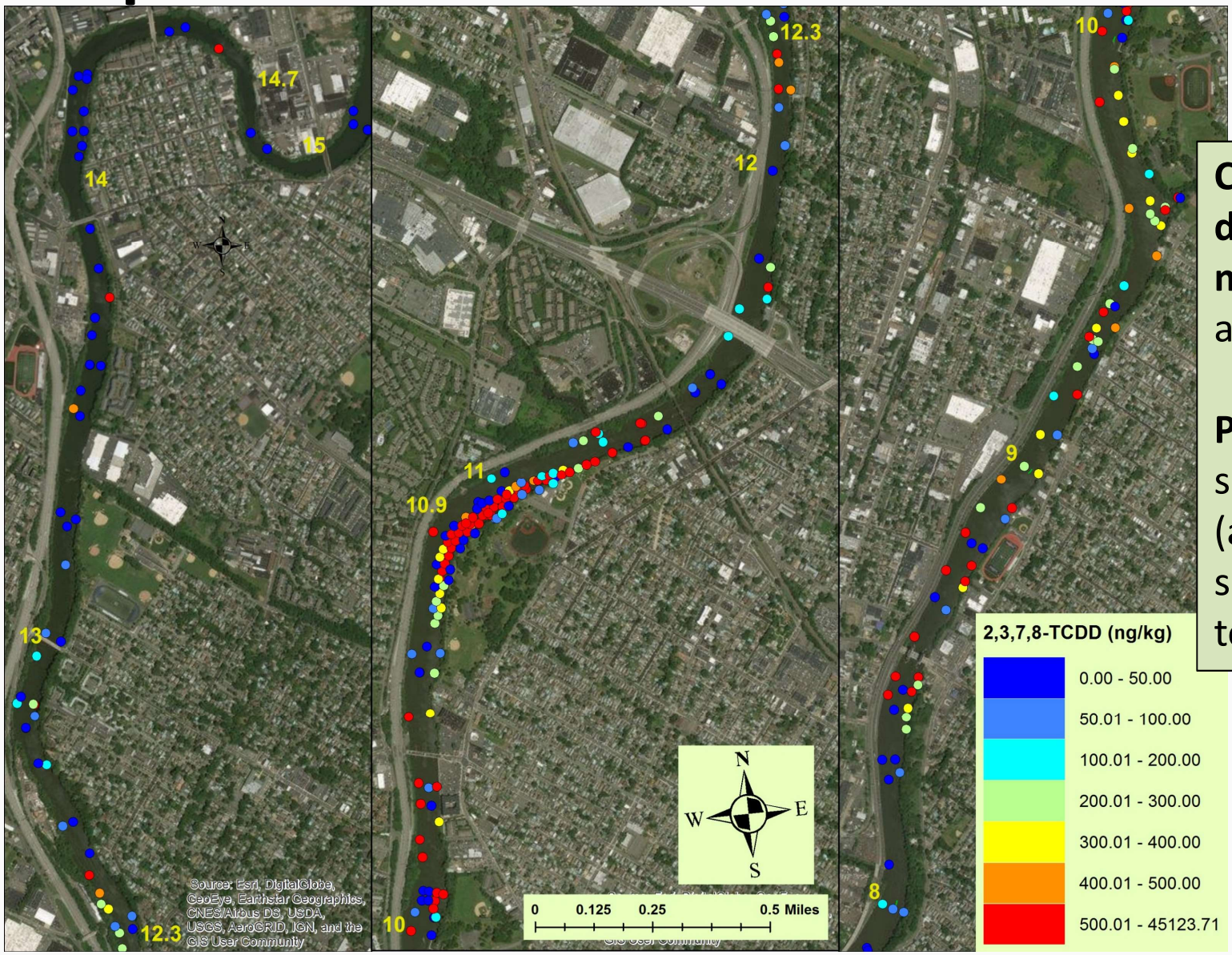
** Sediment sampling will be performed in PDI

CPG's Proposed PDI Program and Model Refinements

- **PDI Program**
  - Implement sediment sampling: 80-foot grid spacing
  - Conduct baseline investigation: Bathymetry, water column, and biota
    - comparison with post remediation conditions
- **Model Refinements with PDI and Baseline Data**
  - Refine calibrations and reduce uncertainty
  - Improve forecasting capabilities
  - Finalize bioaccumulation model - support tissue recovery predictions
  - Develop recovery curves, trigger metrics, and refined PRGs

Item for CSTAG discussion: PDI data should be of sufficient quantity (density) and quality to inform the model and decision making.

Sample Distribution in Surface Sediment



Current sample density (shown in map): 0.8 samples per acre (approximately)

PDI sample density: 8 samples per acre (approximately); surface and subsurface to be collected

CPG's Proposed Interim Action Monitoring

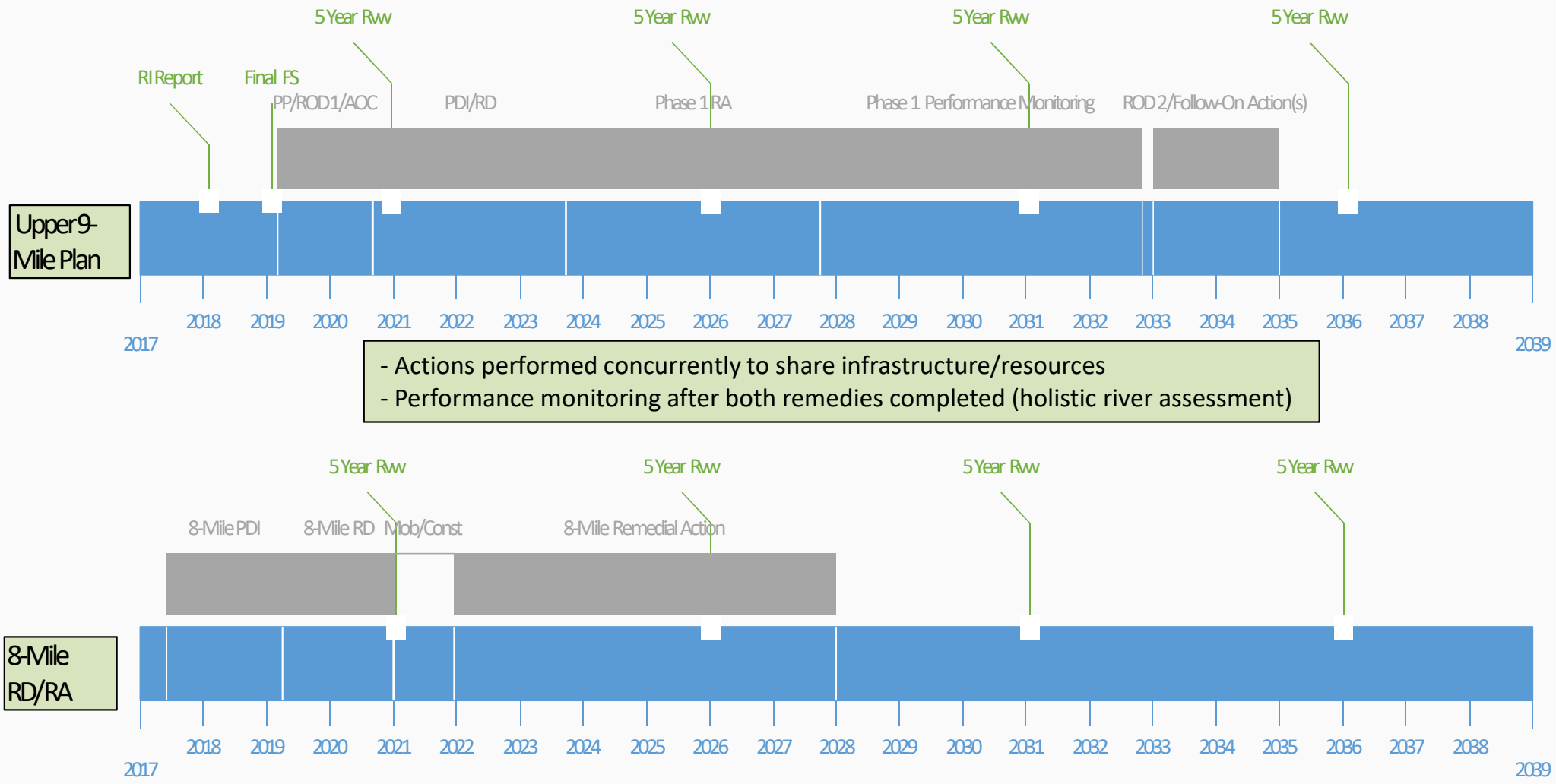
- **Baseline**
  - Establish pre-interim action conditions for comparison with post-action conditions
    - Bathymetry survey (2012 most recent survey)
    - Physical and Chemical Water Column and Biota
- **Construction**
  - Assess best management practices (BMPs) and performance during action
    - Physical and Chemical Water Column and Biota
- **Performance**
  - Evaluate system response
    - Year 0 – Bathymetry, Water Column, Biota, Sediment
    - Long Term
      - Primary: Bathymetry, Water Column, Biota
      - Diagnostic: Water Column, Biota, Sediment
  - Conduct Operation and Maintenance (O&M)
    - Cap integrity and performance

Item for CSTAG consideration: Interim Action monitoring has been proposed by, and discussed with the CPG. However, the proposal is not as evolved as the PDI sampling proposal. Establishing a robust baseline data set and monitoring parameters must be achieved.

Performance Monitoring Decision Framework

- If primary monitoring data consistent with projections, then no change and ROD2
- If primary monitoring data inconsistent with projections, then diagnostic data
  - New data, interpretation and assessment possibilities
    - Increased monitoring frequency to confirm conditions of concern
    - Focused sampling to isolate area(s) of concern
    - Bathymetric evaluation
    - Model recalibration
    - CSM refinement
    - Source identification
  - Lack of recovery primary and/or diagnostic data
    - additional remedial actions will be evaluated/selected and ROD2
  - Slow recovery primary and/or diagnostic data
    - revisit CSM and model projections, re-evaluate risk reduction timeframes, continue monitoring or consider additional actions and ROD2

CPG's Proposed Interim Action Schedule



CPG's Projected Outcomes and Benefits of the Proposed Interim Action

- Reduction in SWAC of 2,3,7,8-TCDD approximately 90 percent, thus reducing risk from the compound by approximately one order of magnitude (co-location would reduce risk from other chemicals)
- Reduction in SWAC of total PCB to below background
- Concurrent action with the lower 8.3 miles action
  - Minimize the duration of community disruption
  - Reduce the difficulty of interpreting post performance monitoring by limiting the confounding effects of one area on the other.

Item for CSTAG Consideration: EPA continues to evaluate these estimates that the CPG has made regarding the outcomes and benefits of the interim remedy as well as the proposed timeline.

CPG's Proposed Remedial Action Objectives

- Control the principal sediment sources of 2,3,7,8-TCDD and Total PCBs, thereby attaining a 90% reduction in the 2,3,7,8-TCDD surface weighted average concentration (SWAC) and a reduction in Total PCB SWAC to below established background[1] . Source areas are identified as those areas where sediment concentrations in the top six (6") inches exceed remedial action levels (RALs)[2] between RM 8.3 and RM 15. To the extent that controlling these source areas do not attain the SWAC reduction targets, additional areas will be remediated to achieve the target SWAC reductions.

[1]Post Source Control IR SWAC concentrations for Total PCBs are estimated [by the CPG] to be below background concentrations established in the OU-2 FFS for the lower 8.3 miles.

[2]Initial Remedial Actions Levels (RAL) are proposed as 300 ng/kg of 2,3,7,8-TCDD and 1 mg/kg of Total PCBs for the Feasibility Study and will be re-evaluated during the Remedial Design [according to the CPG's proposal].

CPG's Proposed Remedial Action Objectives (continued)

- Control the potential exposure of additional subsurface sources of 2,3,7,8-TCDD and Total PCBs by remediating surface sediments between RM 8.3 and RM 15 with a demonstrated potential for net erosion and shallow subsurface sediment concentrations (6-18 inches below the surface) that exceed the RALs.

- Following implementation of the Interim Remedy, monitor to confirm that post-remedial recovery is progressing towards achieving expectations for tissue concentrations and apply adaptive management to identify additional response actions, if needed to achieve acceptable risk.

Item for CSTAG Consideration: The three remedial action objectives have been proposed by the CPG and are being considered by EPA. EPA may request the CPG to adjust the objectives or include additional objectives.

CPG's Proposed Feasibility Study Alternatives

- **Each alternative assumes completion of the lower 8.3 mile remedy**

- **Three Alternatives proposed by the CPG**
  - *No Action RM 8.3 to RM 17.4*
    - Monitoring to evaluate recovery between RM 8.3 and RM 17.4
  - *Targeted capping with dredging for flood control, RM 8.3 to RM 15, 1.5-ft dredge depth*
    - Footprint basis: Identified sediment source areas between RM 8.3 and RM 15, consisting of surface sediment with concentrations exceeding RALs and subsurface sediment with concentrations exceeding RALs in potential erosional areas
    - Engineered cap with reactive layer, dredge depth = 1.5 ft

CPG's Proposed Feasibility Study Alternatives (continued)

- *Targeted capping with dredging for flood control, RM 8.3 to RM 15, 2.5-ft dredge depth*
  - Footprint basis: Identified sediment source areas between RM 8.3 and RM 15, consisting of surface sediment with concentrations exceeding RALs and subsurface sediment with concentrations exceeding RALs in potential erosional areas
  - Conventional cap, dredge depth = 2.5 ft

Item for CSTAG Consideration: The alternatives to be evaluated in the feasibility study have been proposed by the CPG and are being considered by EPA. EPA may request the CPG to adjust the alternatives or evaluate additional alternatives.

EPA's consideration of other source control interim action alternatives to evaluate in the FS include:

- Alternative RALs from those presented by CPG
  - 2,3,7,8-TCDD:
    - Lower (e.g.,100, 200)
    - Higher (e.g.,400)

CPG's Proposed RALs:
2,3,7,8-TCDD: 300 ppt
Total PCB: 1 ppm

- Spatially Varying RALs in the upper 9 miles
  - Areas along the shoreline without multi beam bathymetry data which may achieve greater contaminant concentration reduction in biota
  - Areas that have not accumulated sediments
  - Erosional areas

Topics for continued discussion with CPG:

- Impact of RAL on SWACs and risk
- Post-remedy risk estimates need to be revised using species/location-specific exposure concentrations
  - Once calibration of bioaccumulation model is complete
  - After bioaccumulation model has been peer-reviewed
- Performance monitoring framework must be robust and included in the FS
- During RD, EPA will need to ensure PDI data are of sufficient quantity (density) and quality to inform model and decision making
- Evaluation and potential revision of the remedial action objectives

Region 2 is requesting CSTAG's feedback on the following items:

1. Appropriateness of a source control interim action for the upper 9 miles of the Lower Passaic River Study Area (LPRSA) at this time

2. Consideration of the Cooperating Parties Group (CPG) proposed interim action
   - Is a RAL of 2,3,7,8-TCDD 300 ppt adequately justified
   - Is a reduction in SWAC of 90% a reasonable first remedial step
   - how much specificity can be in the FS regarding appropriate decision points and response to decision points

3. Development of remedial alternatives
   - CPG's proposed alternatives
     - Two alternatives OR a variation of one alternative
   - EPA's proposed alternatives
     - Different RALs (e.g.,100, 200, 400)
     - Spatially varying RALs